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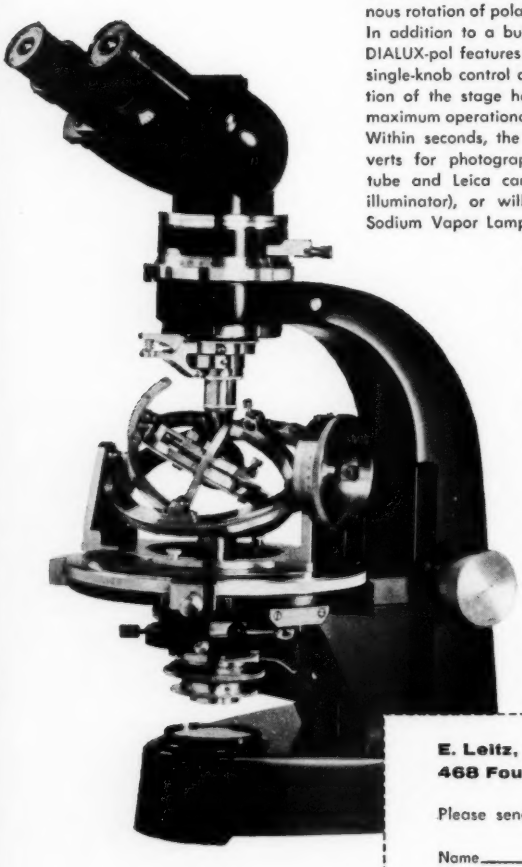

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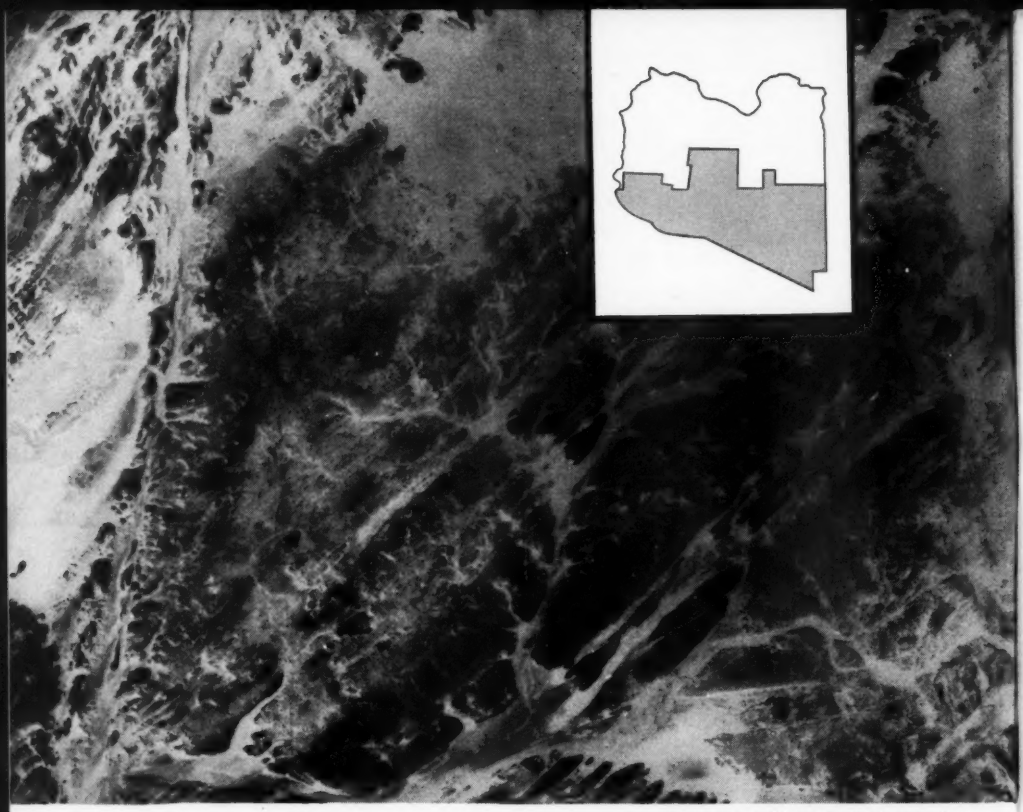

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Calendar

Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.

May 16-17, 1960—SOC. OF PROFESSIONAL WELL LOG ANALYSTS, First Ann. Logging Symposium, Hotel Tulsa, Tulsa, Okla. Write: Dick Short, P.O. Box 7371, Brookside Sta., Tulsa 18, Okla.

*May 25-28, 1960—AAPG: Western Canada Regional Meeting with Alberta Soc. of Petr. Geol. as host, Banff Springs Hotel, Banff, Alta. May 28, trips from Banff to Golden, B. C., and to Minnewanka-Canmore area to study structure of Rocky Mtns. and Devonian, Mississippian and Lower Mesozoic of Banff area. Write: G. G. L. Henderson, Calif. Standard, Medical Arts Bldg., Calgary, Alta., Canada. Maps and Notes.

June 20-23, 1960—CANADIAN SOIL SCIENCE SOC., Ann. Meeting, Guelph, Ont., Canada.

July 25-Aug. 6, 1960—IUGG: General Assembly, Helsinki, Finland. Inquire: Sec. Gen. G. Laclavere, 30 Avenue Rapp, Paris 7, France.

*Aug. 6-12, 1960—19th INTERNATIONAL GEOGRAPHIC CONGRESS, General Assembly of the IGU and meetings of the IGU Commission, Stockholm, Sweden. Inquire: The International Geographic Congress Postfack Stockholm 6, Sweden.

Aug. 14-24, 1960—7th INTERNAT. CONGRESS OF SOIL SCIENCE, Madison, Wisc.

*Aug. 15 - 25, 1960 — XXI INTERNATIONAL GEOLOGICAL CONGRESS, to be held at the Mineralogical Geological Museum of the University of Copenhagen in Denmark. Field trips before and after the meetings.

Aug. 20-25, 1960—INTERNAT. MINERAL. ASSOC., 2nd General Meeting; Mineralogical Museum, Univ. of Copenhagen, Denmark.

Aug. 30-Sept. 2, 1960—ELEVENTH ALASKA SCIENCE CONF., sponsored by AAAS, Alaska Division, Cook Inlet Branch, Anchorage.

Sept. 11-16, 1960—AMER. CHEM. SOC., 138th Meeting, New York City.

Oct. 2-5, 1960—AIME: Soc. of Petr. Eng., Fall meeting, Denver.

Oct. 5-7, 1960—AIME: Rocky Mountain Minerals Conf., Newhouse Hotel, Salt Lake City, Utah.

Oct. 6-8, 1960—9th NATIONAL CLAY CONF., Purdue Univ., Lafayette, Ind. Write: J. L. White, Agronomy Dept., Purdue Univ.

Oct. 12-14, 1960—AAPG: SW Fed. of Geological Soc's., 3rd Ann. Meeting, Wooten Hotel, Abilene, Texas.

Oct. 13-15, 1960—OPTICAL SOC. OF AMERICA, Somerset Hotel, Boston, Mass.

Oct. 18-21, 1960—ACerS: 13th Pacific Coast Regional Meeting, Ambassador Hotel, Los Angeles, Calif.

*Oct. 19-21, 1960—GULF COAST ASSOC. OF GEOL. SOC'S., 10th Ann. Convention, Buena Vista Hotel, Biloxi, Miss. Host: Miss. Geol. Soc. Theme: "The Future of Gulf Coast Oil." Technical sessions, entertainment and post meeting field trip. Write: A. E. Blanton, Gen. Chrmn., P. O. Box 422, Jackson, Miss.

Oct. 20-21, 1960—AIME: Los Angeles Basin Sect., Fall Meeting, Huntington Sheraton Hotel, Pasadena, Calif.

*Oct. 31-Nov. 3, 1960—GSA: Ann. Meeting, in conjunction with PS, MSA, GS, SVP and SEcG, Denver Hilton Hotel, Denver, Colo. Field trips before and after the meetings, also local excursions. Write: E. D. McKee, U.S. Geol. Survey, Federal Center, Denver, Colo.

Nov. 3-4, 1960—AAPG: Pacific Section, Ann. Meeting, Ambassador Hotel, Los Angeles.

GEOTIMES CALENDAR

Meeting notices for the GeoTimes Calendar should be submitted in concisely edited form to:

Mrs. Kathryn Lohman
GeoTimes Calendar Editor
2101 Constitution Ave., N.W.
Washington 25, D.C.

Nov. 7-10, 1960—SEGp: 30th Ann. Internat. meeting, Moody Convention Center, Galveston. Write: W. B. Lee, Jr., Gulf Oil Corp., Dr. 2100, Houston 1, Tex.

Dec. 2-3, 1960—N.A.G.T., Texas Sect.—Texas Acad. of Sci.; Texas Christian Univ. Campus, Fort Worth, Texas.

Dec. 26-31, 1960—AAAS, Annual Meeting, New York City.

1960 SCHEDULE OF FIELD TRIPS

For additional field trips held in conjunction with meetings, see those items marked with an asterisk under meeting calendar.

May 15?—HOUSTON GEOL. SOC., trip probably to Grimes Co. Texas to study Miocene outcrops. Write: Society, 234 Esperson Bldg., Houston, Texas. Guidebook.

May 20?—FIELD CONF. OF PENNSYLVANIAN GEOLOGISTS, trip to SE Penna. to study Piedmont Paleozoics of Triassic lowlands. Write: M. N. Shaffner, Bur. Topo. & Geol. Survey, Harrisburg, Pa.

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Sept. 9-10—FRIENDS OF THE PLEISTOCENE, field trips at Promontory Point (SP Railroad) gravel pit in Little Cottonwood Creek area (20 mi S of Salt Lake City). Lake Bonneville stratigraphy and correlations with glacial units. Write: R. B. Morrison, U.S.G.S., Federal Center, Denver, Colo., or H. D. Goode, U.S.G.S., 503 Federal Bldg., Salt Lake City, Utah.

Sept. 29-Oct. 1—WEST TEXAS GEOL. SOC., trip to Apache Mtns. and Delaware Basin to study oil fields and Permian system; write: Eugene Greenwood, P.O. Box 1600, Humble Oil Co., Midland, Tex. Guidebook.

Sept. 1—FOUR CORNERS GEOL. SOC., trip to east-central Utah and west-central Colo. to study salt anticlines; write: K. G. Smith, P.O. Box 1501, Durango, Colo.

Oct. 8-9—NEW ENGLAND INTERCOLLEGIATE GEOL. CONF., trip to west-central Maine to study strat. and struct. and correlation to E. New Hampshire; write: Andrew Griscom, Geophysics Branch, USGS, Washington 25, D. C. Guidebook.

Oct. 8-9—TRI-STATE GEOL. FIELD CONF., trip to north-central Iowa to study Mississippian strat. and shoreward phase of Penn. sections; write: Leo Thomas, Iowa State College, Ames, Iowa. Guidebook.

Oct. 19-20—GULF COAST ASSOC. OF GEOL. SOCS., trip of Coastal Mississippi and Alabama to study recent marine sediments and Cenozoic. Write: A. E. Blanton, P.O. Box 422, Jackson 5, Miss. Guidebook.

Oct. 14-16, 1960—CALIF. ASSOC. OF ENGINEERING GEOLOGISTS, 3rd Ann. Meeting, Univ. of Calif. at Berkeley. Write: CAEG, P.O. Box 4164, Sacramento 21, Calif.

May 21—ILLINOIS STATE GEOL. SURVEY, trip to McHenry Co., Ill. to study glacial features of Wisconsin and Ordovician and Silurian rocks. Write: George M. Wilson, Survey, Urbana, Ill. Guidebook.

May 21-22—EASTERN FRIENDS OF PLEISTOCENE GEOLOGY, Ann. Meeting, western New York glacial geology, Dunkirk, N. Y. Inquire: E. H. Muller, Geol. Dept., Syracuse University, Syracuse 10, N. Y.

FIELD TRIP CALENDAR

Most of the information regarding field trips in this calendar appears through the courtesy and cooperation of the AAPG Field Trip Committee. Corrections, additions and new trip notices should be sent to George H. Fentress, Chairman, AAPG Field Trip Committee, P. O. Box 2585, Denver 1, Colo., with a carbon copy to GeoTimes Calendar, American Geological Institute, 2101 Constitution Ave., N.W., Washington 25, D. C.

Aug. 3-5—WYOMING GEOL. ASSOC., trip to Big Piney-LaBarge area, Snyder Basin and Wind River Mtns. to study geology of westernmost Wyoming overthrust belt. Write: C. A. Burk, Box 1331, Casper, Wyo. Guidebook.

Sept. 7-10—BILLINGS GEOL. SOC., trip to Hebgen Lake earthquake and Madison slide of Yellowstone Park area to study local strat. and struct.; write Society. Guidebook.

Sept. 8-10—INTERMTN. ASSOC. OF PETR. GEOLOGISTS—E. NEV. GEOL. SOC., joint field trip, to include the geology of Central Nevada in the Ely region. Write: Walter M. Winfrey, Box 269, Ely, Nevada.

Stone Mountain, Georgia. Illustrations from Georgia Mineral Newsletter Vol. XI No. 3.
Williams & Heintz Map Corporation, Washington 27, D.C.

This Month in GEOTIMES

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Robert C. Stephenson, EDITOR

Kathryn Lohman CIRCULATION MANAGER

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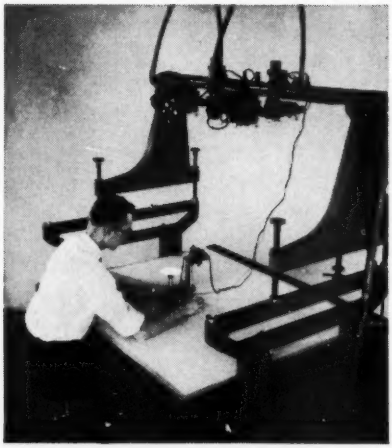

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International Responsibility

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The XXIst International Geological Congress will convene in Copenhagen, August 15-25 with the five Nordic nations as hosts. This is without question a most important meeting of the geologists of the world who will be represented by delegations from all segments of the globe. Since the last session of the Congress in Mexico in 1956, many events have occurred which are reshaping the pattern of the future. The dawning of the jet age is causing the world to shrink. New economic, political and social forces are effecting the usability and accessibility of the geologists' global laboratory. The advent of Sputnik, Tiros and other new scientific accomplishments on the scene has resulted in a great reorientation of thinking and efforts. The International Geophysical Year set a new pattern of coordination and cooperation among those earth scientists of the world who are organized internationally in a way to permit realization of such opportunities.

Against the backdrop of an incredibly rapid change in the pace, scope and orientation of science and the methods of science and scientists, the geologists at Copenhagen will be reviewing the adequacy of their loosely-bonded international relations in the light of the recognizable advantages and disadvantages of the more formally organized international unions of other scientific groups bonded together through ICSU.

Just as the geologists of the world have never seen fit to formally organize as a union, the geologist-delegates of the United States to past sessions of the IGC have not seen fit to present a common front in Council meetings. It would be well for the delegates of this country and particularly the Official U. S. Delegation, traditionally appointed by the State Department, to come to a common practical understanding in advance of the Copenhagen meeting on international professional housekeeping matters affecting the welfare of geology and geologists both at home and abroad.

OUR COVER

Wizard Island, Crater Lake National Park is a volcanic cone within the crater of the once-mighty volcano, Mount Mazama. *Photo by courtesy of the National Park Service.*

The AMERICAN GEOLOGICAL INSTITUTE is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

GEOTIMES is the news magazine of the geological sciences. It reports on current events in the earth sciences, public education and public relations efforts throughout the profession, as well as appropriate legislative and governmental issues. It announces scholarships, fellowships, publications and new developments. It provides a forum for discussion of timely professional problems, and affords a common bond between the many specialized groups within the earth sciences

A proposal for

INTERNATIONAL UNION of GEOLOGY

One of the important matters which will be deliberated by geologists of the world gathered in Copenhagen for the XXI International Geological Congress will be the desirability and feasibility of forming an International Union of Geology. The matter of an International Union was discussed in 1948 at the 18th session in London and again in 1952 when the 19th Congress convened in Algiers, but the Council of the Algiers meeting voted against the proposal for a Union.

Geologists were among the first of all scientific groups to recognize the need for international meeting. The First International Geological Congress met in France in 1878. On the other hand, geologists have been reluctant to give the Congress permanent status including a charter and a permanent headquarters to administer the affairs of the Congress on a continuing basis. Instead, the Congress has been perpetuated on a volunteer basis. Invitations of would-be host countries are presented to the Council of the Congress and invitations are voted upon by the Council. The full responsibility for planning, conducting and financing the Congress rests with the host country (or countries). The business of the Congress rests in the hands of the Organizing Committee which is responsible for all aspects of that Congress. Among the major responsibilities of the Organizing Committee of each Congress is that of publication of scientific papers of the Congress. This and the burgeoning complexity of scheduling excursions, technical sessions and meeting facilities for an ever-growing number of geologists poses increasingly difficult problems for the host nations.

The National Contact Commission[1] of the geologists of Switzerland and the Netherlands on November 30, 1959 submitted to the Organizing Committee a *Proposal to Reconsider the Desirability of Establishing an International Geological Union.*

The proposal suggested that a Commission be formed by the XXIst IGC to study this subject and report to the XXII Congress (in 1964). The proposal, signed by H. M. E. Schurmann for the Netherlands and L. Vonderschmitt for Switzerland, drew attention to the need for the formal international union as a mechanism for facilitating and financing the work of commissions of the Congress such as the Commissions of the Geological Map of the World, the Lexicon of Stratigraphy and the International Geological Abstracting Service. As it is now, these commissions lead a very precarious existence. Travel funds are non-existent, operating funds must be donated and publication funds are in no way assured by the Congress, despite the fact that the Com-

[1] The Organizing Committee of the XXI IGC requested in the First Circular that:

"Any proposal to modify the statutes of the Congress must be submitted in writing to the Organizing Committee at least nine months before the opening of the session. The Committee transmits the text of these proposed modifications to the institutions represented at the previous session.

Any modification of the Statutes must, in order to be adopted, receive votes of two-thirds of the Members of the Council and must be ratified by two-thirds of the Members of the Congress present at the General Assembly at which the modification is made.

missions are established by the Council of the Congress.

It was further pointed out in this proposal that geologists, lacking an international union also lack a voice in the International Council of Scientific Unions, ICSU (pronounced "Ick-su"), which is of growing importance in the international affairs of all sciences.

Drs. Schurmann and Vonderschmitt also point out the need for internationally-coordinated research efforts in geology comparable to that of the International Geophysical Year developed through the efforts of the International Union of Geodesy and Geophysics and ICSU.

Moving concurrently with the National Contact Committees of Switzerland and the Netherlands, the British geologists organized under the Royal Society a British National Committee for Geology to act as the National Contact Committee for the United Kingdom. This newly-formed committee of the Royal Society in November 1959 submitted to the Organizing Committee a proposal for the formation of an International Union of Geology. The British proposal is reproduced here as it appeared in the Third Circular for the XXI IGC.

PROPOSAL FOR THE FORMATION OF AN INTERNATIONAL UNION OF GEOLOGY[1]

Preamble

1. The formation of an International Union of Geology was discussed by the Councils of the 18th and 19th Sessions of the International Geological Congress in London (1948) and Algiers (1952).

The Council in Algiers rejected a proposal for the immediate formation of a Union, but agreed a proposal to strengthen international geological collaboration within the framework of the Congress by the institution within each participating country of a 'National Contact Committee' to act as the agent of liaison between the Bureau of the Congress and the Organizing Committees of its Sessions, and the geologists and geological institutions within the country. A country might set up a new committee for this purpose, or designate an existing society or institution.

2. The Geological Society of London undertook in 1953 to act as the National Contact Committee for the United Kingdom. Since that time the functions and potentialities of the Contact Committees have progressively increased. The Geological Society of London therefore recently requested the Royal Society to institute a separate and broadly representative British National Committee for Geology, to act as the National Contact Committee for the United Kingdom in relation to the Congress.

The Council of the Royal Society agreed to this request, and appointed a British National Committee for Geology, with Professor Leonard Hawkes, F.R.S., as Chairman, on 12 February 1959.

3. The National Contact Committee for the Netherlands has recently initiated reconsideration for the formation of an International Union of Geology, and has requested the views of the British National Committee on a draft proposal, for submission to the Council of the 21st Session of the Congress in Copenhagen in 1960, that a Commission of the Congress shall then be set up 'to study the advantages and disadvantages of an International Union of Geology and to report upon this subject at the 22nd International Geological Congress.'

4. The British National Committee is in sympathy with the principle of the proposal and in agreement with the reasons advanced by the Netherlands Contact Committee, in Annexes to the draft, to show that present circumstances warrant and require reconsideration of the question of a Union.

5. The British National Committee, however, is of the opinion that a further step should be taken at Copenhagen in 1960; namely that the Council of the 21st Session should consider a specific proposal for the formation of an International Union.

6. The rejection of previous proposals for an International Union has largely derived from fears that its formation might diminish the authority and responsibility for the host-countries for future Sessions of the Congress, and that the autonomy of future Sessions and of their associated programmes of field excursions might be imperilled. The British National Committee wholly agrees that it is essential to avoid these dangers. On the other hand it believes that the existence of a suitably constituted Union could materially assist the Organizing Committee of a Session. The constituent National Committees of the Union could act as National Contact Committees for Congress Affairs, and the transference of some or all of the Commis-

[1] Submitted to the Organizing Committee for the XXIst International Geological Congress by the British National Committee for Geology of the Royal Society in November 1959.

sions of the Congress to the Union could relieve a part of the arduous work of the Organizing Committee of a Session.

The work of the Commissions could also be facilitated, since the International Union would be a permanent body with an income from which the Commissions might obtain financial assistance.

The ordinary meetings of the Council of the International Union of Geology should normally, for convenience, be held during the period of a Session of the International Geological Congress and in the same place. The Executive Committee of the Union would, to this end, request the Organizing Committee for the Session to provide facilities for these meetings at times which would not conflict with the main programme of the Session.

The Congress and the Union should be complementary and collaborative but autonomous organizations. The President of a Session of the Congress should not necessarily or usually be at the same time the President of the Union.

The proposal and suggested Statutes which follow have been drafted with these points in mind.

Proposal

To further the advancement of geology it is proposed that an International Union of Geology be formed. Its principal objects would be

(a) to promote the study of geological problems

(b) to facilitate international cooperation in geology

and to seek admission as a member of the International Council of Scientific Unions (ICSU).

Among the advantages of there being such a union are

(1) it would provide a continuing international body to represent the views of geologists in the international relations of science

(2) it could facilitate the work of international commissions on geological subjects, such as the Commission on an International Geological Map of the World, the Commission on a Lexicon of Stratigraphy, the Commission on an International Journal of Geological Abstracts.

It is further proposed that consideration be given to the formation of such a Union at the forthcoming 21st Session of the International Geological Congress (Copenhagen, 1960) with a view to seeking admission if possible to the International Council of Scientific Unions at its General Assembly in 1961.

Such admission is governed by the following conditions:

'Any Union desiring to become a Scientific Member of the Council shall communicate its Statutes to the Secretary-General at least six months before a meeting of the Executive Board. Each Union is free to choose an internal structure best suited to its own needs. Thus a Union may be divided into sections or associations: two or more Unions may combine to form a new Union.

The Statutes of Unions seeking admission to the Council should:

(a) indicate the objects of the Union.

(b) provide the direction of the work of the Union by a General Assembly of its members.

(c) indicate the scale of contributions payable by national organizations.

(d) set forth the rules governing voting.

No Union can be accepted as a Scientific Member unless:

(1) it has the support of twelve countries.

(2) it, or the organization it has succeeded, or of which it is an offshoot, has been in existence for at least six years, and has held or sponsored at least two international meetings.

Any application from a Union for Scientific Membership of the Council shall be communicated by the Secretary General to the members of the Executive Board and to the Council.'

(By-law 3.7 of ICSU)

To aid the consideration of this proposal a first draft of Statutes is attached as a basis for discussion. It will be noted that the draft Statutes make provision for the work of commissions and, should the proposal to form a Union meet with favour at the International Geological Congress in 1960 the Congress may also be ready to consider inviting the Union when formed to accept the Commissions of the Congress as Commissions of the Union.

(Continued on page 38)

Leonardo da Vinci

. . . *the Geologist*

by Jules R. DuBar [1]

Almost every generation, century and historic period have produced men of outstanding character and exceptional ability who have helped to direct the human race forward out of a vast quagmire of ignorance, bigotry and tradition. There is a strong bond between these men that has no time limitation. They transcend the temporal, they elude death, they are forever among us, belonging to no nationality and to no historical period. In a restricted sense they belong only to each other; a more liberal view sees them integral with posterity and truth. They are the giants. Such a man was and is Leonardo da Vinci, whose life was consumed in a feverish attempt to quench a burning thirst to acquire knowledge and to create things beautiful.

Fossils and Fossilization

Had da Vinci ignored his many other fields of endeavor and reported only his observations concerning the nature of fossils, his niche in scientific history would have been secured. Despite the commonly accepted but fantastic ideas of his day and the prejudicial views of organized Christendom, he recognized and clearly defined the true origin of fossils. Unfortunately his views were not embraced by the majority of the men of science for another 300 years.

Several men recognized the true origin of fossils earlier than Leonardo, but they failed to elaborate on their ideas and thus had little or no influence on the thinking of the investigators who followed them. The notes of da Vinci [2] indicate that he, on the contrary, had given the study of fossils and extant marine organisms much consideration. He became familiar with the habits and environments of marine invertebrate animals and applied his knowledge of marine species to the fossils he observed in the rock strata of his homeland. This study establishes him as one of the earlies ecologists and paleoecologists.

Numerous ideas prevailed, during and preceding Leonardo's lifetime concerning the origin of fossils. Several of these, in no particular order, are listed below.

1. Sports of nature
2. Work of an occult power
3. Irradiations from the stars
4. Chance
5. Previous failures of the Creator
6. Generated by vapors resulting from fermentation in the rocks below
7. Seeds that grew in the rocks
8. Created in place by Satan to tempt mankind
9. Carried into place by the "Great "Deluge"

The last one (the Great Deluge) seems to have aroused Leonardo's ire and was perhaps the immediate cause of his investigations in the field of paleontology. Be this as it may, it was in attempting to disprove this belief that da Vinci set forth many of his observations concerning fossils. Point by logical point he presented overwhelming evidence that should have forever banished any claim to authenticity for this erroneous concept. Following are several of his arguments which give us insight into his comprehension of paleontology and marine biology. (1, p. 349-368.)

1. Cockles (clams) could not, since they are relatively immobile, travel very far in 40 days; not nearly so far, at least, as fossil clams were observed by da Vinci.
2. The shells could not have been washed inland by strong currents inasmuch as the valves of many fossil clams are found united in pairs indicating that they have been relatively undisturbed, and therefore

[1] Jules R. DuBar, Assistant Professor, University of Houston.

[2] *The notebooks of Leonardo da Vinci:* (Trans. by Ed. MacCurdy), Jonathan Cape, London, Volume 1, 655 pp. (1945).

must have lived at or near the place of burial.

3. Rains falling on the land would have formed streams which have flowed seaward and would have tended to sweep the abandoned shells toward the sea rather than inland.
4. The ecological and natural biological assemblages were found undisturbed. That is, fossil animals and plants were discovered to be associated with one another as in living marine communities. Transportation inland would have destroyed all such relationships.
5. Inasmuch as several layers of fossils could be observed in the strata with thicknesses of barrren rock between there would have had to have been several "Great Deluges".
6. Sea level had not in the time of man been known to fluctuate much in a short period of time.

All of these ideas are acceptable to present-day geologists and several have become fundamental principles in palentological investigation.

In addition, Leonardo was able to differentiate between fossils preserved in the breaker zone, in which wave action and marine currents prevail and those preserved in the relatively quiet and deeper marine waters. He knew that along a shoreline sea shells are apt to be broken, valves separated, and communities destroyed.

He states in his notes (1, p. 350-351) *'. . . that where the dead ones went the living were not far distant and in these mountains are found all living ones for they are known by their shells being in pairs. . . . and a little higher up is the place where all the dead with their shells separated have been cast up by the waves."*

The idea that the stars might have controlled the position and presence of fossils in rocks also attracted da Vinci's disdain. He left no doubt as to his evaluation of this opinion when he wrote (1, p. 357) ". . . *another set of ignoramuses maintain that nature or the heavens have related them (fossils) in these places through celestial influence."*

He went on to state that it was peculiar that if fossils were created in place and had never been living organisms that both old and young were found side by side, that some were broken, wave worn, bored by predators, or that only fragments of others were to be seen. The following quotation (1, p. 351-352) from his notes emphasizes this point:

"As for those who say that these shells are found to exist over a wide area having been created at a distance from the sea by the nature of the locality and the disposition of the heavens, which moves and influences the place to such a creation of animal life, to these it may be answered that granted such an influence over these animals it could not happen that they were in one line except in the case of animals of the same species and age and not the old with the young, nor one with an outer covering and another without its covering, nor one broken and another whole, one filled with sea sand, and the fragments great and small of others inside the whole shells which stand gaping open; nor the shells of other species fastened onto them like animals crawling over them and leaving the mark of the track on the outside where it has eaten its way like a worm in wood; nor would there be found among them bones and fishes teeth which some call arrows and other serpents' tongues; nor would so many parts of different animals be found together unless they had been thrown up there upon the borders of the sea."

He had something to say of the methods of fossilization. He realized that generally only the hard exoskeleton or shell of an invertebrate is preserved by burial in the mud and silt. He even spoke of a petrifying juice which permeated the more porous shells and helped preserve them. Such a process is today called permineralization.

Paleogeography and Earth Movements

Inasmuch as da Vinci understood fossils and fossilization so well it would be logical to conclude that he recognized that the outlines of the continents and oceans could not have always been as he knew them. His "Notes" indicate this to be a justifiable conclusion. The surprising thing is the extent of his insight into the matter.

Every student of geology knows that the continents have not always had the same size, shape and configuration as today. They also are aware that more or less periodically (during geologic time) there have been great upheavals in the earth's crust which have caused segments of the ocean floor to be literally shoved and squeezed hundreds or even thousands of feet into the air. Sometimes these segments have been uplifted gently without being otherwise greatly deformed.

The student also learns that after mountains have been worn down to a flat, low plain by erosion, forces within the crust may once again cause the strata to be

slowly uplifted. While one region rises, another, (commonly an adjacent area) may slowly subside under the load of rock particles eroded and transported there from the uplands. All of this activity in this old earth's crust (the student is told) apparently is an essentially never-ending attempt to reach some sort of equilibrium between various deep-seated stresses.

That da Vinci should have understood and believed even a part of this is doubly remarkable since he lived at a time when mountains, continents, oceans, etc. were generally considered permanent, indestructable and unalterable features. For example, da Vinci knew that strata of the mountains and plains which contained fossils similar to organisms in the present day ocean, regardless of how far inland or how high above sea level they may be now originally must have accumulated beneath the sea.

Proof of this is contained in the following da Vinci statement: (1, p. 374) ". . . *and through this the remainder of the earth having made itself lighter by that part from whence the said gravity fell will of necessity remove itself from the center of the world, and the earth and the mountains will emerge out of the sphere of the water lightened by this part and will make itself lighter by the weight of the water which rested upon it, and will come so much the more to raise itself towards the sky. And the sphere of the water in this case does not change in position, because its water fills up the place from which the gravity of this part of the earth that fell divided itself and thus the sea remains in itself without change of height. And this may also be the reason why the marine shells and oysters that are seen in the high mountains, which have formerly been beneath the salt water are now found at so great a height, together with the stratified rocks, once formed of layers of mud carried by the rivers in the lakes, swamps, and seas, and in the process there is nothing that is contrary to reason.*"

He also wrote: (1, p. 359): "*And the peaks of the Apennines stood up in this sea in the form of islands surrounded by salt water. Nor did Africa as yet behind its Atlas Mountains reveal the earth of its great plains naked to the sky some 3,000 miles in extent; and on the shore of this sea stood Memphis; and above the plains of Italy where flocks of birds are flying today fishes were once moving in large schools.*"

While he demonstrates his appreciation of uplift he says nothing of folding or fracturing. In fact, he seems to have preferred to ignore almost entirely the subject of intense deformation.

Running Water

To anyone who has read the geological notes of da Vinci there can remain no doubt that he fully respected and understood much of the power and work of running water. In fact, he was so impressed that he seems to have over-emphasized the importance of streams in forming mountains by dissection of plains and plateaus.

He knew that rivers generally make their own valleys and do not, as men believed for a century or more later, obediently follow previously formed, castrophic rents in the earth's crust. With the simple statement, "Every valley has been made by its river and the proportion between valleys is the same as that between rivers" (1, p. 339) he seems to have anticipated by more that 200 years the theories of John Playfair (1748-1819) and other great geologists generally considered to have laid the foundation of modern geological thinking. It is interesting to note the similarity of Leonardo's idea in this quote from Playfair's "Illustrations of the Huttonian Theory of the Earth", "Every river appears to consist of a main trunk, fed from a variety of branches, each running in a valley proportioned to its size. . . ."

Concept of Geologic Time

Leonardo said nothing of geologic time and as far as I know made no estimate of the length of time involved in the cycle of uplift, erosion, marine inundation, deposition and uplift. However, it is logical to conclude that he would have rejected any proposal that the earth was only 6,000 years old. Nevertheless, he showed he had no idea that the age of the earth might be measured in millions, even billions of years as presently known. The following quotation indicates he thought in terms of thousands of years rather than millions (1, p. 363): *Since things are far more ancient than letters, it is not to be wondered at if in our day there exists no record of how the aforesaid seas extended over so many countries; and if moreover such record ever existed the wars, the conflagrations, the changes in speech and habits, the deluges of the waters have destroyed every vestige of the past. But sufficient for us is the testimony of things produced in the salt waters and now found again in the high moun-*

(Continued on page 37)

The School Science Teacher

A New Roll for the Graduate Geologist

by GATES WILLARD [1]

Even before Sputnik, many American public schools were busy revising and improving science curricula. However, recent events have accelerated their efforts. Now that the federal government is subsidizing the purchase of equipment for new science courses through the Title III Program, and special institutes for science and mathematics teachers are mushrooming in colleges and universities from coast to coast, it will not be long before some major changes will become evident. Where does geology fit into the scheme? Should the schools place greater emphasis upon the earth sciences in the future?

THE NEED FOR MORE SCIENCE

There is increasing pressure on the part of parents, scientific organizations, colleges and many other groups to offer *more science*. However, many of them are unfamiliar with the problems of training young minds. Teachers are acutely aware of the fact that most children will not go to college, and a large proportion of those who do further their education will not be scientists. However, they will all be voting citizens and the value of an understanding of the scientific enterprise can hardly be denied. Indeed, the general tone of TV commercials would be quite different if the public were better informed! Nevertheless, it would be well to study the whole picture very carefully before recommending drastic changes or additions where the school curriculum is concerned. What kinds of science should the schools be teaching?

There is a general hue and cry for more and more subject matter but the schools can never be equipped to teach *all* branches of science. The human mind should not be thought of as a bottomless cavern into which an endless stream of scientific knowledge may be funneled. Indeed, much factual material supposedly "learned" is forgotton all too soon. However, scientific skills, attitudes and appreciations will be retained long after the facts have been lost. For this and other reasons, many schools are trying to teach *methods of science* as a significant part of the program.

TEACHING METHODS VS. SUBJECT MATTER

In the schools, subject matter cannot be considered separately from the way it is taught, and teaching methods vary with the type of student. Third graders *can* be made to learn an abstract body of knowledge such as algebra. However, it is exceedingly doubtful whether the considerable extra time required to do this would be well spent. Are there other learnings which an eight-year-old needs more? Obviously, courses must be presented in different ways to different age groups. Furthermore, the degree of mental maturity plays a definite part in the ability to absorb *efficiently* different kinds of subject matter.

How should science be taught? Regardless of their intelligence, youngsters learn best through first-hand experiences which are likely to make lasting impressions. In colleges, lectures may do a satisfactory job of explaining phenomena. However, the "grown-up" individual has developed ability to visualize things which he does not see in front of him. Even the bright school child, on the other hand, has had relatively few experiences in the world and, although he can memorize and parrot facts as they were told to him, he will have little *understanding* of a topic such as metamorphism unless he has been able to *see* a very graphic demonstration of the process. There is some justification in limiting the science curriculum to those materials which may be studied in the laboratory or demonstrated in some manner. Fortunately, most of science can be learned directly rather than by reading or lecture.

Problem solving methods in teaching deserve consideration. Youngsters should

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be given an opportunity to think for themselves. For example, a ninth grader would not be given a tray of minerals and told to memorize their properties (*and* their formulas) so that he could identify a tray of unknowns the following week. A possible alternative would be to hand out a small box of three or four minerals and have the students furnish pieces of glass, files, pennies and pieces of unglazed porcelain. The problem would be to experiment to find ways of distinguishing between different kinds of minerals. Perhaps there would be no need to identify the minerals just yet, but try to keep students from looking up the minerals on their own!

The "cookbook" type of laboratory exercise does not help the school student understand what an actual experiment would be like. If students are given identical printed directives listing all of the materials needed and explaining how to do each step, they need only follow instructions. If they weigh everything correctly, the right answer appears and the experiment ends. On the other hand, students can be given a problem to solve such as, "How do crystals grow?" Rather than telling students exactly how to find the answer they can be helped to plan their own experiments. Different kinds of equipment and materials will be used by various students as they attempt to solve the common problem. They will record their observations and try to learn about the factors which control crystal growth. Some may even want to make microscopic studies. Their hard work is rewarded by the joy of discovery. Learning by experimentation is a time-consuming process and it certainly puts a strain upon the teacher! It would have been possible simply to tell students the factors which affect crystal growth. However, which method would teach scientific procedures as well as facts about crystal growth? Which method would spark more interest and enthusiasm for science among students? Will problem-solving methods help students to become adults who can think critically and creatively?

Geology in the Schools

Much of geology can be learned by school students but it must be teachable by problem solving methods. It should be recognized that abstract ideas and concepts based upon a pre-knowledge of mathematics, chemistry, or physics may well be beyond the grasp of many. However, as an *introduction* to the other sciences, there is an excellent application.

EARTH SCIENCE TEACHERS NEEDED

In states where the teaching of earth sciences is already underway, the big problem is to find adequately trained teachers. New York, Pennsylvania and Connecticut are three states where such a need exists.

Geology graduates with adequate training in math, physics and chemistry may qualify provisionally to teach earth sciences.

For example, much simple chemistry can be learned while studying minerals. Through the earth sciences, major principles of biology, chemistry and physics may be drawn together so that the student can begin to see that the sciences are interrelated. Nevertheless, most school teachers are not aware of these possibilities because they have never taken any course in geology.

Geology majors can become successful school teachers if their personalities are suited to the job. The science background is sufficient for teacher license or certification in most states and only the education courses must be taken. However, the value of psychology and methods courses as well as supervised practice teaching cannot be denied. As pointed out before, public school kids behave and learn differently from college students. Remember also that the teacher has a captive audience. Some will *dare* the teacher to teach them anything! It is very important to motivate learning by arousing interest. Unfortunately, many teachers who are recent college graduates tend to teach the way they were taught in college—by lecturing. But the talking approach does not always stimulate young minds. Youngsters want to see and do thing themselves. What aspects of geology are most teachable in the classroom?

Geology majors interested in public school teaching might consider the following points:

1. Forget the idea that schools are desperate to get *scientists*. They want *science teachers* who know how to teach. There is a shortage of competent people. There is no shortage of incompetents who do not know how to handle youngsters.

2. The schools do not need surplus C and D college students who couldn't get jobs in industry. As long as there are mediocre teachers with an unsatisfactory

(Continued on page 34)

GEOLOGY-GEOPHYSICS STUDENTS in the UNITED STATES AND CANADA in 1960[1]

	Colleges Queried	Colleges Responding	Total Geology-Geophysics Students	No. In Geology	No. In Geophysics	Per Cent Undergrad.	Per Cent in MA Program	Per Cent in PhD Program
				UNITED STATES				
1960	232	232	9,091	8,525	566	64.6	21.3	14.1
Change in 1960	2.6%	2.6%	-12.6%	-13.3%	-2.2%	-4.6	.7	3.9
1959	226	226	10,407	9,828	579	69.2	20.6	10.2
1958	210	207	10,197	9,817	380	72.8	18.2	9.0
1957	207	204	9,439	9,145	294	73.0	18.2	8.8
1956	205	194	8,093	7,765	328	72.0	18.3	9.7
				CANADA*				
1960	18	18	878	786	92	69.5	20.6	9.9
Change in 1960	-	-	6.7%	6.4%	9.5%	-3.3	3.1	.2
1959	18	18	823	739	84	72.8	17.5	9.7
1958	16	16	749	692	57	74.8	14.1	11.1
1957	16	16	594	560	34	72.9	16.8	10.3

*Not surveyed in 1956.

Table 1. A summary and comparison of the 1960 total student enrollment in geology and geophysics in colleges and universities of Canada and the United States with previous years, 1956-1959.

The AGI survey of enrollments of career-minded students in geology-geophysics in the degree-granting departments in colleges and universities of Canada and the United States is now in its fifth year. It is significant to note that AGI has received 100 per cent cooperation of the schools surveyed, but not without a certain amount of effort in the case of a few difficult delinquents.

Tables 1 and 2 summarize the data collected on the junior-senior majors and the masters and PhD programs in the colleges and universities of the U. S. and Canada.

The 1960 survey indicates a fairly stable situation in Canada, as compared with previous years, but a toboggan-slide drop in the undergraduate (Junior-senior) geology-geophysics majors in schools in the United States. It is obvious that the poor employment picture over the past several years, particularly for students with no graduate training, has caused a marked drop in enrollments in geology-geophysics.

The data presented in this preliminary report, will be published in the 1960 Edition of AGI Report 12, *"Survey of Geology-Geophysics Students in Colleges and Universities of the United States and Canada."*

In Canada, as indicated by Figure 1, there was an increase in junior majors. The senior majors enrollment was about static, as was that of the enrollment in the PhD program. There was a significant increase in the Masters candidates.

In the United States (fig. 2) the drop in junior majors which began in 1957 became almost precipitous in 1960. There was also a sharp drop in senior majors following the trend established by junior majors in 1957. Perhaps the most disturbing aspect of the 1960 survey results is the nearly 10 per cent drop in the number of masters candidates which had risen steadily since the survey was first started in 1956. Countering this drop, however, was a noticeable increase in the over-all enrollment in the PhD program.

The year 1961 may well be critical in

[1] Compiled by Mrs. Bonnie Henderson, Supervisor, Earth Science Register; American Geological Institute from data collected in February-March from department heads.

	GEOLOGY							GEOPHYSICS				
	1960	% Change In 1960	1959	1958	1957	1956	1960	% Change In 1960	1959	1958	1957	1956
						UNITED STATES						
Undergraduate												
Seniors	3037	-14.8	3566	3511	2928	2269	130	-24.9	173	92	54	58
Juniors	2589	-22.2	3329	3722	3819	3421	115	-14.2	134	103	86	84
MA												
Candidates	1787	-9.7	1978	1760	1644	1391	153	-6.1	163	94	76	87
PhD Program												
Degree Year	270	31.7	205	198	167	150	43	72.0	25	23	23	20
Int'med. Year	517	18.6	436	379	374	305	74	13.8	65	42	49	52
First Year	325	3.5	314	247	213	229	51	168.4	19	26	6	27
Total PhD program	1112	16.4	955	824	754	684	168	54.1	109	91	78	99
						CANADA*						
Undergraduate												
Seniors	231	1.8	227	231	182		25	-19.3	31	10	5	
Juniors	324	2.5	316	291	232		30	20.0	25	28	14	
MA												
Candidates	161	22.9	131	95	91		20	53.8	13	11	9	
PhD Program												
Degree Year	25	-13.8	29	30	17		6	-14.3	7	3	2	
Int'med. Year	23	21.0	19	21	20		7	75.0	4	2	3	
First Year	22	29.4	17	24	18		4	-	4	3	1	
Total PhD program	70	7.8	65	75	55		17	13.3	15	8	6	

* Not surveyed in 1956

Table 2. A summary and comparison of 1960 student enrollment in geology-geophysics at various academic levels in colleges and universities of Canada and the United States with that of the previous years, 1956-1959.

determining trends in the training of geoscientists. Should the enrollment of undergraduate majors continue to slide, it seems almost inevitable that the enrollment in the masters programs will continue on a downward trend and the enrollment in the PhD program conceivably could join the over-all downward trend.

The field of geophysics has grown quite rapidly as a result of the new emphasis on geophysical research stemming from the IGY. This growth has been primarily in areas of the science other than exploration geophysics and other parts of the realm of solid earth geophysics. It should be noted that many career geophysicists, however, are not trained in departments of geology-geophysics, so the picture presented by these tables and graphs is somewhat misleading.

	Junior-Senior Majors and Graduate Students	Non-majors	Total Students
		United States	
Geology	8,525	52,683	61,208
Geophysics	566	363	929
Total	9,091	53,046	62,137
		Canada	
Geology	786	3,974	4,760
Geophysics	92	68	160
Total	878	4,042	4,920
TOTAL	9,969	57,088	67,057

Table 3. A summary of all students enrolled in geology courses in the geology-geophysics degree granting institutions of the U. S. and Canada in 1960. This table includes all students who are taking geology courses as non-majors as well as junior-senior majors and graduate students.

While collecting these data on the enrollment of career-oriented students of geology-geophysics, it was decided to request data on the non-majors taking geology-geophysics courses as a part of their general educational background in the sciences. The results of this tabulation are given in table 3. It appears that for every career-oriented undergraduate and graduate taking courses in the geosciences

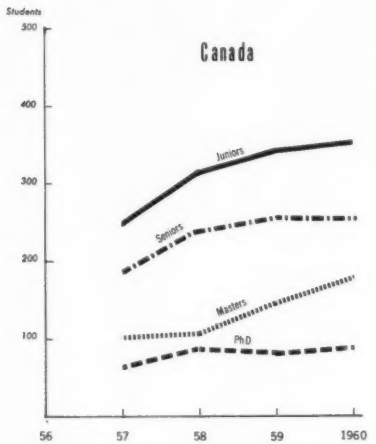

Figure 1. Graph showing trends in enrollment of geology-geophysics students at various academic levels in colleges and universities of Canada in the years 1957-1960.

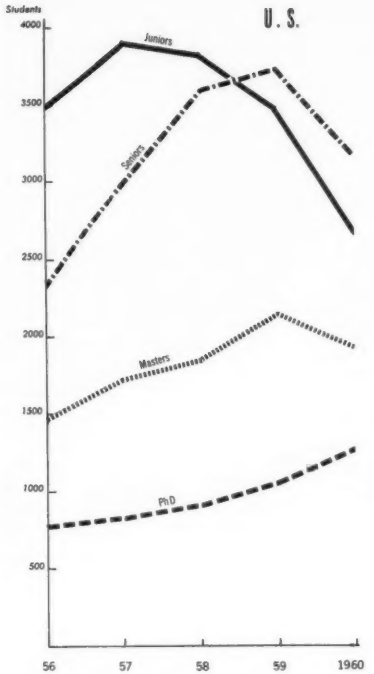

Figure 2. Graph showing trends in enrollment of geology-geophysics students at various academic levels in colleges and universities of the United States in the years 1956-1960.

there are 6 non-majors taking geology as a part of their general education.

As usual the 1960 survey attempted to arrive at generalizations concerning the employment outlook for current graduates as reviewed by department heads (table 4). Information on starting salaries was also requested, but these data are so variable as to allow only the broadest possible generalizations. It appears that starting salaries for those men who have only a bachelors degree decreased as much as $15-$25 per month from the average salary of $445 prevailing in 1959. This obviously reflects the low demand for men with only bachelor's training. Starting salaries for men with a masters degree appear to average $540-$550 per month. Starting salaries for PhD's range from $7000 to $10,000 per year, depending upon the man and the situation. Salaries for men entering geophysics were slightly higher than those of geologists.

Education Level	Employment Outlook		
	Better	About Same	Worse
Seniors	17	128	36
M. A.	34	109	12
Ph. D.	21	36	2

Table 4. A comparison of the 1960 employment outlook of graduates in the geosciences with the 1959 outlook as reported by 183 U. S. colleges and universities in January-February 1960.

The above figures are based on domestic employment. Overseas assignments carry an average salary bonus of about 20 to 25 per cent.

Although the employment outlook is grim for men with only undergraduate training, it appears to be fair for most

ESTUARY AND COASTLINE CONFERENCE

Sponsored by MIT, June 20-July 1, 1960

A special summer program on ESTUARY AND COASTLINE HYDRODYNAMICS will be sponsored on the campus of the Massachusetts Institute of Technology, June 20-July 1, by the Department of Civil and Sanitary Engineering.

This two-week program is intended to meet the needs of engineers engaged in the design and development of all types of ramine structures in which gravity wave action and tidal phenomena are important. A general and concise review of the theory will be given including the most recent results of experimental and analytical research. Topics include: generation and transformation of waves, damping by boundary layer action, wave refraction and diffraction, resonant conditions in harbors, interaction of waves and marine structures, coastal currents, sediment erosion and deposition, tidal dynamics of estuaries and inlets, saline and fresh water interaction, steady and unsteady diffusion processes in estuaries, coastal and tidal models. The lectures will be given by staff of the Hydrodynamics Laboratory of the Department of Civil and Sanitary Engineering and will be coordinated with presentations by other distinguished experts in the field. Dr. Arthur T. Ippen, Professor of Hydraulics, will be in charge of the program.

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master's candidates and reasonably good for PhD candidates. This situation is not too unhealthy, because it is a generally accepted fact that too many geoscientists have been entering upon professional careers with inadequate academic training. The current employment picture serves to emphasize this point.

Looking to the future, one might foresee a continuing downward trend in enrollment which would eventually affect both the quality and quantity of graduate students being trained. Employment opportunities might continue to shrink; on the other hand there may be a growing demand for well-trained geoscientists. Should the demand grow and enrollments not anticipate such an increase in trained manpower, there will again be a shortage of new and capably trained talent. If this happens, recruiting will reach once again into the reserves of less than competent persons, some of whom will have inadequate academic background. The result? The competence of the profession which is now on the rise, as reflected in over-all ability and the average depth of academic training of the new blood entering the profession, will suffer significantly.

Carl Shipek, (third from left) a marine geologist, was one of three winners of Bausch and Lomb Photogrammetric Awards presented recently at the 26th Annual Meeting of the American Society of Photogrammetry. Shipek is employed at the U. S. Navy Electronics Lab at San Diego and is doing graduate work at Scripps Institute of Oceanography for his paper on "Surveying the Deep Sea Floor with Cameras." Pictured above are the winners (left to right); Chas. Ballon, Jr. (Cornell); Jerry Masters (Illinois); and Shipek together with R. J. Sparling (right) of Bausch and Lomb who presented the awards.

AGI REPORT 12, *1959 Edition*, "SURVEY OF GEOLOGY-GEOPHYSICS STUDENTS IN THE COLLEGES AND UNIVERSITIES OF THE UNITED STATES AND CANADA IN 1958-59 AND OF AVAILABLE SCHOLARSHIPS, ASSISTANTSHIPS, ETC.," *23 pages, 1960, $0.50.*

A detailed listing of geology and geophysics graduates by school, together with generalized data on available financial aid.

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A report on the second year of the

AGI VISITING GEOSCIENTIST PROGRAM

The second year of the AGI Visiting Geoscientist Program is drawing to a successful conclusion. During the 1959-60 academic year this program made possible the visits of 42 nationally recognized geoscientists to 81 colleges and universities in the United States. The program intended primarily to benefit the smaller departments of geology-geophysics in various colleges and universities and has been hailed as highly worthwhile by both the visiting geoscientists and the institutions visited.

The program has been supported through a grant from the National Science Foundation. Funds are already assured for the continuation of the program during the academic year 1960-61. A selection committee will meet during the summer to develop a roster of scientists from which the 1960-61 participants will be invited to participate. The program is administered with advisory aid of the AGI Education Committee, C. J. Roy, Chairman.

Schools participating in the program indicate the specialties of visitors that they would like to have. Selections of visitors are based on the specialties requested, geographic location of schools, schedule dates, and travel budget limitations. Both the visiting geoscientists and the schools are given the option of accepting the proposed arrangement.

Details of the campus visit, which is usually 2-3 days in duration are left to the host institution and the visitor. The program is usually built around 2 to 4 formal lectures, but ample time for informal discussion between the visitor and students and faculty members is considered vital to the success of the program. Some visitors give public lectures, some go with students and faculty members on local field trips. Important too are the meetings of the visiting geoscientists with presidents and deans of the host instituitions and with other science faculty members who gain new appreciation of the geological sciences.

One needs only to scan the visit reports and correspondence of the first two years of this program to recognize the far-reaching importance of this program in upgrading the teaching of the geosciences in the smaller departments.

AGI VISITING GEOSCIENTISTS
1959-60 ACADEMIC YEAR

VISITING SCIENTISTS	HOST INSTITUTIONS
Richard G. Bader	Florida State University
	University of Georgia
Charles C. Bates	Wesleyan University
	Trinity College
Robert L. Bates	
	Southeast Missouri State College
	Southern Illinois University
James R. Balsley, Jr.	
	University of New Hampshire
	Harpur College
Robert F. Black	Kent State University
	Hanover College
Arthur F. Buddington	
	Michigan School of Mines & Technology
	University of Minnesota Duluth
Daniel A. Busch	Beloit College
	Macalester College
Albert V. Carozzi	Pomona College
	San Diego State College
Arthur B. Cleaves	Dickinson College
Lewis M. Cline	Tulane University
	Mississippi Southern College
Edwin H. Colbert	
	Southern Methodist University
Byron N. Cooper	Middlebury College
	Dartmouth College
Ronald K. DeFord	DePauw University
	Miami University
Edwin B. Eckel	Notre Dame University
	South Dakota School of Mines & Technology
Richard M. Foose	Occidental College
Richard P. Goldthwait	
	Gustavus Adolphus College
	State University of South Dakota
Carlyle Gray	Hamilton College
John C. Griffiths	University of Rochester
	University of Massachusetts
John T. Hack	Earlham College
	Ohio Wesleyan University
Arthur F. Hagner	Allegheny College
	Waynesburg College
Benjamin F. Howell, Jr.	
	University of Kansas City
	University of Wichita
Charles B. Hunt	Cornell College
	Kansas State University
	Reed College
Keith M. Hussey	Midwestern University
	University of Louisville

(Continued on page 26)

Committee of 1000 for AGI 1960 Reaches 570

Your Contribution of $10 or more will aid AGI in its efforts to serve the geosciences

It is significant to note that in 1960 an increasing number of geoscientists are making tangible their support of the AGI through a contribution of $10 or more to enroll them in the Committee of 1000 for 1960. In addition many others, including many students are making smaller contributions in support of AGI and GeoTimes.

The "alumni association" approach of seeking money from individuals is not the most satisfactory way of obtaining funds. There is little choice, however, since the Constitution of the Institute makes no specific demands on any one or any society to support AGI. We are faced with two alternatives: (1) return to the early days of AGI when funds permitted little more than a "name on a door," or (2) develop funds wherever and however we can to provide minimum support for the many functions and services which are requested by various segments of the profession and which are befitting of a federation of geoscientists.

The Committee of 1000 for AGI for 1960 will be applied in part to support GeoTimes, but only about 25 per cent of the total amount contributed will be needed for this purpose. The balance will go into supporting general operations of the AGI in the fields of education, public relations, government relations and professional relations. These funds are essential for the planning and development of new programs. It is planned that the Institute when it is reorganized will no longer need to seek such supplemental funds from the profession, but until the reorganization is consumated these funds will be vital.

Your contribution of $10 or more will enroll you in the Committee of 1000 for AGI and will serve as a vote of confidence which can be translated into a better program in the service of the geosciences and geoscientists.

For your convenience use the special envelope appearing in the center of GeoTimes, January-February 1960.

Your contribution to AGI is tax-deductible.

RECENT ADDITIONS TO THE COMMITTEE OF 1000 FOR AGI—1960*

C. H. Atchison
Roger C. Baker
W. F. Barbat
Brian M. Barrow
G. Wallace Bayne
Charles B. Belt, Jr.
Robert L. Benish
R. H. Bixby
Eliot Blackwelder
Mrs. Margaret F. Boos
Ebert E. Boylan
Edward Bradley
William C. Bradley
J. C. Brice
Louis Briggs
John G. Broughton
Nelson K. Brown
Dudley H. Cardwell
Ward Carithers
Hubert F. Carson
Robey H. Clark
Chalmer L. Cooper
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Samuel N. Namowitz
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Ronald Bruce Parker
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Guy R. Pierce
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F. W. Preston
James F. Ralstin
Robert G. Reeves
Edward E. Rue
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W. L. Russell, Jr.
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W. T. Schneider
Edward J. Schwing
Francis Sewell
Glenn L. Sheperd
William W. Shisler
Sigma Gamma Epsilon Gamma Chapter, Univ. of Okla.
Richard W. Smith
Harry R. Stenson
C. K. Stiff
George E. Stoertz
Robert Stone
Frederick Stugard, Jr.
George A. Thiel
Samuel F. Turner
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Bennie Walthall
S. E. Watson
Warren B. Weeks
R. W. Whipple
J. G. Woodward
Jean Davies Wright

* Previous lists published in GeoTimes, March & April issues.

Department of Geology, Ohio State University

What geologist has not griped about the seemingly perverse way in which science stories are loused up by news writers in the public press? Your correspondent, who has done his share of complaining, is now pleased to tell you that Something Is Being Done. Late in March, the University of North Carolina and the NSF sponsored a 2½-day Science Writers Institute, for some 40 science reporters from southern newspapers. The reporters were divided into 5 groups, each headed by a nationally known science writer. Each group then had 5 half-day sessions, with real genuine scientists, a different field being presented at each session. Geology was represented by H. P. Woodward of Rutgers University (Newark) and your correspondent. . . . As requested, we discussed the current status of basic rather than applied research. In so doing, we had to emphasize the increased blurring of boundaries between geology and the other sciences. We talked about basic research on the nature and thickness of the earth's crust; the floor of the oceans; the polar regions; and determining the earth's absolute age. . . . A good many of the "science writers" turned out to be general reporters who cover occasional science stories, and so we put our discussions on the intelligent-layman level. This paid off, and we were rewarded with close interest, intelligent questions, and warm enthusiasm. . . . In no case did the writers show any tendency to be inattentive or patronizing; on the contrary, they were eager to improve their understanding of the topics covered, and were clearly ready to meet the geoscientist at least half-way in the problem of translating his jargon-filled papers into news stories. . . . We urged that each writer develop a "backfield" of geo-scientists within phoning distance, who would agree to check his facts, give opinions on presentation *(if asked)*, and in general help get better science stories into the papers. We told them (correctly?) that most geologists would be glad to help in this way. So if you get a call from a reporter with a science story, don't give him the brush-off. He wants your help. . . . More such institutes are planned, for other areas. Let's give them our full support.

Geology Source Book Editor

The AGI has engaged the services of Dr. C. V. Crittenden of Charlottesville, Virginia to undertake the final technical editing of the Geology and Related Sciences Sourcebook for Elementary and Secondary School Science Courses which was developed for the most part during the Duluth Conference in the summer of 1959.

The Institute has been fortunate to make arrangements for desk space and use of the library of the Division of Mineral Resources, Department of Conservation and Economic Development in Charlottesville through Dr. James L. Calver, State Geologist. Dr. Crittenden will also have advisory aid when needed from staff members of both the Department of Geology at the University of Virginia and state's Division of Mineral Resources, Department of Conservation and Economic Development.

Dr. Crittenden, a geographer, was formerly associated with the faculty of the University of Virginia and for the past several years has been serving as one of the staff editors on the McGraw-Hill Encyclopedia of Science. He will handle technical editing of the Sourcebook under the direction of Professor Robert L. Heller of the University of Minnesota, Duluth who was Director of Duluth Conference and serves as Chairman of the Steering Committee for the AGI Teaching Resources Development Program.

Currently nearly 100 science teachers across the country are using, testing and preparing evaluations from the teachers point of view. Sections of the 23-unit sourcebook are also being reviewed critically by subject specialists in the profession.

The preliminary draft of the sourcebook has been reviewed by a number of commercial publishers of school text and reference books and about six have expressed keen interest in publishing the book. There has been widespread interest in the project among school administrators, science teachers and science education specialists due to the great amount of attention currently being given to earth science as a course to be added to school science curricula to give new strength and variety.

Plans call for completion of the editing of the source book by Fall and publication by early 1961.

GRAVIMETRIC CONVERSION FACTORS
(2nd of 2 parts)
and other data used in interpreting analyses
of
rocks, minerals and waters

AGI 18b FOLD

Constituent reported	Formula or atomic weight	Weight of one equivalent	Constituent sought	Gravimetric factor
Mn	54.94	(2+) 27.47	MnO	1.2912
		(3+) 18.31	Mn_2O_3	1.4368
		(4+) 13.74	MnO_2 (pyrolusite)	1.5825
MnO	70.94	35.47	Mn	.7745
Mn_2O_3	157.88	26.31	Mn	.6960
MnO_2	86.94	21.74	Mn	.6319
Mo	95.95	(4+) 23.99	MoS_2 (molybdenite)	1.6684
		(6+) 15.99	MoO_3	1.5003
MoO_3	143.95	23.99	Mo	.6666
N	14.008	(3+) 4.669	NH_3	1.2159
			NH_4^+	1.2878
			NO_2^-	3.284
		(5+) 2.802	HNO_3	4.499
			NO_3^-	4.427
			N_2O_5	3.856
NH_3	17.032	17.032	N	.8225
NH_4^+	18.040	18.040	N	.7765
NO_2^-	46.008	46.008	N	.30447
NO_3^-	62.008	62.008	N	.22591
Na	22.991	22.991	NaCl (halite)	2.5422
			Na_2CO_3	2.3051
			$NaHCO_3$	3.6540
			Na_2O	1.3480
NaCl(halite)	58.448	58.448	Na	.39336
			Cl	.60664
			Na_2O	.53023
Na_2CO_3	105.99	53.00	CO_2	.41523
			$CO_3^=$	.56619
			Na	.43382
			Na_2O	.58477
$NaHCO_3$	84.01	84.01	CO_2	.52388
			HCO_3^-	.72613
			Na	.27367
			Na_2O	.36890
$NaNO_3$ (soda niter)	85.00	85.00	Na	.27048
			NO_3^-	.72952
Na_2O	61.98	30.99	Na	.74186
			$NaAlSi_3O_8$ (albite)	8.462
			$NaAlSiO_4$ (nepheline)	4.584
			NaCl	1.8860
Nb	92.91	18.582	Nb_2O_5	1.4305
Nb_2O_5	265.82	26.582	Nb	.6990
Ni	58.71	29.36	NiO	1.2725
NiO	74.71	37.36	Ni	.7858
O	16.000	8.000		
P	30.975	6.195	P_2O_5	2.2914
			$PO_4^{\equiv}$	3.0662
$PO_4^{\equiv}$	94.975	31.658	P	.32614
			P_2O_5	.74730
P_2O_5	141.95	14.195	P	.43642
			$PO_4^{\equiv}$	1.3381
			$Ca_5(PO_4)_3F$, var. (apatite)	2.3692
Pb	207.21	103.61	PbO	1.0772
			PbS	1.1548
			$PbSO_4$	1.4636
PbO	223.21	111.61	Pb	.9283
			PbS	1.0720
			$PbSO_4$	1.3587
PbS (galena)	239.28	119.64	Pb	.8660
			PbO	.9329
$PbSO_4$ (anglesite)	303.28	151.64	Pb	.6832
			PbO	.7360
Rb	85.48	85.48	Rb_2O	1.0936
Rb_2O	186.96	93.48	Rb	.9144
S	32.066		0 (equivalence)	.4990
			FeS_2 (pyrite)	1.8708
		(2-) 16.033	H_2S	1.0629
		(4+) 8.017	SO_2	1.9979
		(6+) 5.344	SO_3	2.4969
			$SO_4^=$	2.9959
SO_2	64.066	16.017	S	.5005
			SO_3	1.2497
SO_3	80.066	13.344	S	.4005
			SO_2	.8002
$SO_3^=$	80.066	40.033	$SO_4^=$	1.1998
$SO_4^=$	96.066	48.033	SO_3	.8335
			$CaSO_4$	1.4172
			K_2SO_4	1.8141
			Na_2SO_4	1.4787

Constituent reported	Formula or atomic weight	Weight of one equivalent	Constituent sought	Gravimetric factor
Sb	121.76	(3+) 40.59	Sb_2O_3	1.1971
			Sb_2S_3	1.3950
		(4+) 30.44	Sb_2O_4	1.2628
		(5+) 24.35	Sb_2O_5	1.3285
Sb_2O_3	291.52	48.59	Sb	.8354
			Sb_2S_3	1.1653
Sb_2O_4	307.52	38.44	Sb	.7919
Sb_2O_5	323.52	64.70	Sb	.7527
Sc	44.96	14.99	Sc_2O_3	1.5338
Sc_2O_3	137.92	22.99	Sc	.6520
Se	78.96		0 (equivalence)	.20263
		(4+) 19.74	SeO_2	1.4053
		(6+) 13.16	SeO_3	1.6079
SeO_2	110.96	27.74	Se	.7116
			SeO_3	1.1462
SeO_3	126.96	21.16	Se	.6219
			SeO_2	.8740
Si	28.09	7.02	SiO_2	2.1392
			SiO_4^{4-}	3.278
SiO_2 (quartz)	60.09	15.023	Si	.4675
			SiO_4^{4-}	1.5325
Sn	118.70	(2+) 59.35	SnO	1.1348
		(4+) 29.68	SnO_2	1.2696
SnO	134.70	67.35	Sn	.8812
SnO_2 (cassiterite)	150.70	37.68	Sn	.7877
Sr	87.63	43.815	$SrCO_3$(strontianite)	1.6848
			SrO	1.1826
			$SrSO_4$ (celestite)	2.0961
SrO	103.63	51.815	Sr	.8456
Ta	180.95	36.19	Ta_2O_5	1.2211
Ta_2O_5	441.90	44.19	Ta	.8190
Te	127.61		0 (equivalence)	.12538
		(4+) 31.90	TeO_2	1.2508
		(6+) 21.27	TeO_3	1.3761
TeO_2	159.61	39.90	Te	.7995
TeO_3	175.61	29.27	Te	.7267
Th	232.05	58.01	ThO_2	1.1379
ThO_2	264.05	66.01	Th	.8788
Ti	204.39	204.39	Ti_2O	1.0391
Ti_2O	424.78	212.39	Ti	.9623
Ti^{++}	47.90	11.98	TiO_2(rutile,anatase)	1.6681
TiO_2 (rutile,anatase)	79.90	19.98	Ti	.5995
			$FeTiO_3$(ilmenite)	1.8993
U	238.07	(4+) 59.52	UO_2	1.1344
			U_3O_8	1.1792
		(6+) 39.68	UO_3	1.2016
UO_2	270.07	67.52	U	.8815
			U_3O_8	1.0395
U_3O_8	842.21	52.64	U	.8480
			UO_2	.9620
V	50.95	(3+) 16.98	V_2O_3	1.4711
		(5+) 10.19	V_2O_5	1.7851
			$VO_4^{\equiv}$	2.2561
V_2O_3	149.90	24.98	V	.6798
			$VO_4^{\equiv}$	1.5337
V_2O_5	181.90	18.19	V	.5602
			$VO_4^{\equiv}$	1.2639
W	183.86	30.64	WO_3	1.2611
WO_3	231.86	38.64	W	.7930
Y	88.92	29.64	Y_2O_3	1.2699
Y_2O_3	225.84	37.64	Y	.7875
Zn	65.38	32.69	ZnO	1.2447
ZnO	81.38	40.69	Zn	.8034
Zr	91.22	22.805	ZrO_2	1.3508
ZrO_2	123.22	30.805	Zr	.7403
			$ZrSiO_4$ (zircon)	1.4877

FOLD

Robert L. Heller

Dr. Robert L. Heller, Chairman of the Department of Geology, University of Minnesota, Duluth and Project Director for AGI's Duluth Conference has been named to serve as Acting Executive Director of the American Geological Institute during July and August, during which period Executive Director Stephenson will be out of the country.

Hedberg Named to Academy

Dr. Hollis D. Hedberg, Professor of Geology at Princeton University and President of the Geological Society of America was recently elected to the National Academy of Sciences. Election to the Academy is one of the highest honors which can be bestowed on a scientist. Dr. Hedberg was one of 35 elected to the National Academy at its April meeting.

AGI DATA SHEETS

Following is a list of data sheets prepared under the auspices of the AGI Data Sheet Committee and available from the American Geological Institute at the indicated prices.

NUMBER	DATA SHEET	PRICE
1-3	Geologic Map Symbols (set of three sheets)	$0.25
4	Availability of Publications and Other Data of the U. S. Geological Survey	0.10
5	Geologic Column and Scale of Time	0.10
6	Comparison Charts for Visual Estimation of Percentage Composition	0.10
7	Comparison Chart for Visual Estimation of Roundness	0.10
8	Major Public Sources of Geological Information	0.10
9	Summary of Geophysical Data	0.10
10	Superposition of Strata: Part 1	0.10
11	Superposition of Strata: Part 2	0.10
12	Abundance of Major Elements in the Earth's Crust	0.10
13	Correction for Dip in Directions Not Perpendicular to Strike	0.10
14	The Geological Surveys of the World (a revision is to be published in GeoTimes, July-August 1960)	0.10
15	Field Conversion Tables	0.10
16	Graph for Determining the Size of Sedimentary Particles	0.10
17	Data Pertaining to Important Non-Silicate Minerals	0.10
18	Gravimetric Conversion Factors	0.10

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Payment Should Accompany Order

THAT FORM!

did you return it ?

25,000 geoscientists in the United States have recently received the 1960 questionnaire for the NATIONAL REGISTER OF SCIENTIFIC AND TECHNICAL PERSONNEL. The Earth Science Register portion of the National Register is conducted by AGI in cooperation with the National Science Foundation.

Please complete and return your questionnaire TODAY if you have not already done so.

Nominate Your Favorite Geologist

for the first trip to the moon.

Geologists Urged For Trip To Moon. Every geologist has at one time or another suggested one of his esteemed(?) colleagues for a trip to the moon, but he would hardly expect to have the suggestion repeated in the New York Times as it was on March 30, 1960 under the above headline.

The proposal was made in all seriousness by the prominent geochemist, Harold C. Urey, Nobel Prize Winner and professor at large at the University of California, LaJolla. Dr. Urey is the author of two recently-released chapters of the report of the Space Science Board of the National Academy of Sciences–National Research Council, Chapter IV, *The Moon and* Chapter V, *The Planets.*

In the chapter on the planets, Dr. Urey reviews briefly the geological-geophysical probabilities of each of the planets and suggests that seismic, magnetic and other geophysical measurements should be sought in exploration and that television observations be planned to shed light on details which may be observed on the surface of the planets.

Much more, of course, is already known about the moon which has been studied in considerable detail by many scientists. A "manned landing" on the moon is already on the drawing board. About this Dr. Urey states the following:

"The scientific qualifications of the first man to go to the Moon are important. He should have a considerable knowledge of several fields of science, but he should be particularly a hard-rock geologist with some acquaintance with meteorites. All plans in this respect, however, should be made with the realization that the Moon is very different from the Earth and that naive analogies are useless. The surface of the Moon will not be like that of the Earth. The surface origin is quite different, and in particular, there will be no sedimentary rocks."

Geologists should include the report of the Space Science Board, Science in Space (chapters I-IX) in their required reading just as they should another Aacdemy report, Oceanography 1960-1970, for in these reports they can find many of the challenges for the future of geology and other earth sciences.

Returning to the tone of the opening paragraph of this news note, it is visualized that within the geological profession there will be nominating and screening procedures established to assure that the hard-rock geologist chosen to carry our banner to the moon will be eminently qualified. The big problem will be in establishing the criteria–should they be scientific or personal?

Toronto Mineral Club Awards Student Prize

The Walker Mineralogical Club of Toronto announces that it has awarded its Peacock Memorial Prize (1959) of two hundred dollars "for the best scientific paper on pure or applied mineralogy, including crystallography, mineralogy, petrology, ore genesis, and geochemistry," submitted by a graduate student, to Dr. John Gittins, Department of Geophysics and Geochemistry, College of Mineral Industries, Pennsylvania State University, University Park, Pennsylvania.

Dr. Gittins paper was entitled *"The Petrology of the Nepheline-Bearing Rocks of Glamorgan and Monmouth Townships, Ontario, Canada."* He did his work under Professor C. E. Tilley and Dr. S. R. Nockolds at the University of Cambridge, England. Dr. Gittins emigrated to Canada from Manchester, England, in 1948 and resided in Hamilton, Ontario. Prior to doctoral studies at Cambridge, he attended McMaster University, Hamilton, Ontario, where he earned his BSc. in Honour Geology in 1955, and his MSc. in 1956.

Competition for the Peacock Memorial Prize is open to any author who is a graduate student enrolled in a Canadian University, a Canadian graduate student in any university, or any graduate student on a Canadian subject.

For further information on eligibility for the 1960 award competition write the *Secretary, Walker Mineralogical Club, 100 Queen's Park, Toronto 5, Ontario.*

Kerr Honored at Occidental

Occidental College in Los Angeles, California recently conferred an honorary Doctor of Science degree on Dr. Paul F. Kerr, Newberry Professor of Mineralogy at Columbia University, in recognition of his World-War II work on uranium mineral raw materials, his contributions to clay mineralogy and studies of ore deposits.

Popular Geology in print

by Mark W. Pengborn, Jr.

Last, but by no means least among the Darwin centennial-year books is THE DEATH OF ADAM (Iowa State U. Press, 1959, $4.95) by historian of science *John C. Greene*. Despite its load of scholarship, this is a most readable history of the rise of the theory of organic evolution and of the decline of static creationism, from the time of Newton and Ray to Darwin's era; much of the story is told in the words of the researchers themselves, a good reason why scholar and layman alike will enjoy this lucid volume; handsome illustrations and abundant bibliographical notes.

Another worthwhile Darwin item is *Millicent E. Selsam's* attractive abridgement of the 1845 edition of THE VOYAGE OF THE BEAGLE (Harper, 1959, $3.95); about half the length of the original and provided with explanatory notes, this book is ideal for older children and adults. Sure to fascinate scientists and intelligent laymen—with good eyes—is the inexpensive reprint of APES, ANGELS, AND VICTORIANS (Meridian Books, 1959, $1.45), *William* Irvine's brilliantly written double biography of Darwin and his popularizer, T. H. Huxley; well documented.

Darwin's chief American backer is the subject of *A. Hunter Dupree's* ASA GRAY (Harvard U. Press, 1959, $7.50), a first and definitive biography of the great Harvard botanist. Gray's rather cloistered life—he set himself up as *the* American taxonomic authority and was thereby tied to his herbarium—may not appeal to all readers, but scientists and serious laymen will surely want this splendid volume; exhaustive bibliography.

Gray may have routed his Harvard associate, Louis Agassiz, in their debate on evolution, but the latter's fabulous charm generally put Gray in the shade when it came to gathering funds, friends, and disciples. Agassiz and Elizabeth Cary Agassiz are the subjects of ADVENTUROUS ALLIANCE (Little, Brown, 1959, $5), *Louise Hall Tharp's* pleasing double biography of the Swiss-born glaciologist-zoologist and his capable wife, founder of Radcliffe College. Mrs. Tharp stresses the social rather than the scientific story, and her book is fine for the general reader; illustrations adequate, but no bibliography. Of more interest to the specialist is *Henry R. Warfel's* UNCOLLECTED LETTERS OF JAMES GATES PERCIVAL, neurosis-ridden poet and geologist (U. of Florida Press, 1959, $2).

History of science fans will delight in *William H. Goetzmann's* ARMY EXPLORATION IN THE AMERICAN WEST, 1803-1863 (Yale U. Press, 1959, $6.50), which summarizes the activities of the Corps of Topographic Engineers and its scientists as they surveyed, observed, and collected. Washington politics and Army rivalrys are not ignored; abundantly documented, with a "bibliographical essay" and good illustrations and maps.

VISITING GEOSCIENTISTS

(Continued from page 20)

Richard H. Jahns ..... Baylor University
Sul Ross State College

Sheldon Judson ..... University of Florida
University of Dayton

Walter D. Keller ..... Muskingum College
Oberlin College

George A. Kiersch ..... University of Alaska

Wilson M. Laird ..... The Principia College
Drury College

Kenneth K. Landes ..... Carleton College
Hardin-Simmons University

Harry E. LeGrand ..... Berea College
University of Kentucky

Raymond C. Moore
Washington & Lee University

Grover E. Murray ..... University of Chattanooga
Emory University

Schailer S. Philbrick ..... Boston College

Meyer Rubin ..... Colorado College
Syracuse University

J. Frank Schairer ..... St. Lawrence University
Colgate University

Francis P. Shepard ..... University of Hawaii

Laurence L. Sloss ..... Bates College
Colby College

Matt Walton ..... Marietta College
College of Wooster

Harold R. Wanless
Southwestern Louisiana Institute
Southern State College

Lawrence A. Warner ..... Fresno State College
San Jose State College

Herbert E. Wright, Jr. ..... Montana State College
University of Idaho

Hatten S. Yoder, Jr.
North Carolina State College

Hughes M. Zenor ..... University of Tennessee
University of Virginia

James H. Zumberge
University of Puget Sound
West Washington College of Education

Geologists Study Moon Features

The rapid advance made in the detailed study of the surface of the moon, as an initial step toward the first lunar landing, was described by geologists of the Geological Survey in a special Moonwatch program of the Geological Society of Washington, held in the John Wesley Powell auditorium of the Cosmos Club Feb. 24, the United States Department of the Interior announced.

Dr. Arnold C. Mason announced completion of the first phase of the terrain study of the moon. This study is being made by the Geological Survey as part of a joint project with the Army Map Service of the Corps of Engineers, who are preparing a map of the moon. The map will serve as a base for displaying the terrain information. The terrain study and the map will be at a scale of one inch equals about 80 miles. A further joint project is being considered on a scale several times larger.

In the first phase of the Geological Survey's study, a team headed by Survey photogeologist Robert J. Hackman employed modern stereoscopic methods to plot the relationships of surface features. To complete the terrain study, interpretations will be made of the moon's surface constituents, texture, and bearing power. The analysis will include the results of newly developed radar and geophysical techniques applied to lunar study. The moon's surface will then be divided into regions and subregions, and the distinguishing characteristics of each will be described. Various detailed features will be represented by specially selected symbols overprinted on the lunar map, with an accompanying explanatory text.

Dr. Eugene M. Shoemaker, also of the Geological Survey, discussed the origin of the lunar crater Copernicus, which has extending from it rays as long as 500 miles. These light-colored streaks are so pronounced that many amateur observers have seen them even with relatively small telescopes.

The rays were interpreted by Dr. Shoemaker as being splashes of crushed rock derived from the impact of large fragments ejected from Copernicus. Many streaks extend away from Copernicus starting from visible impact gouges as much as 5 miles across. The radial ray pattern evidences that the Copernicus crater results from the impact of a large meteorite. A minor earth satellite could not have collided with the moon at a speed sufficient to have developed a ray system so large. Nor could Copernicus result from lunar volcanism, as volcanic ejecta would have accumulated in a diffuse rather than a ray pattern.

BOWIE MEDALIST FRANCIS BIRCH (center) of Harvard University receives the William Bowie Medal for achievement in geophysics at the recent meeting of the American Geophysical Union from President Lloyd V. Berkner (left) while Perry Byerly, who presented the citation, looks on. (Photo by Chase, Ltd.)

The speakers pointed out that the study of the surface of the moon will be highly valuable for moon exploration. Knowledge of the moon's surface will enable selection of the most important landing site for initial scientific investigation. Advance information on the probable characteristics of lunar surface materials will aid in designing proper tools for excavation should taking refuge underground be necessary for survival, as when surface temperatures soar above 200°F. during the long lunar day. Data on the texture and bearing power of surface materials, combined with data on the gradients of slopes, will enable designing of a lunar surface vehicle.

The speakers added that application of the techniques of geologic study to the moon's surface, augmenting what has already been learned by astronomers, will broaden man's knowledge of the moon. In addition, an attempt will be made to determine the most likely origin of the various lunar features, and the history of these features insofar as possible.

MANPOWER *in a column —*

By HOWARD A. MEYERHOFF
Scientific Manpower Commission
1507 M Street, N.W., Washington 5, D. C.

We have been properly bawled out by one GeoTimes reader for worrying about saving the Army's Critical Skills Program and not attending to the effective utilization of geologists inducted for two years of military service. We provided the irate reader with references to back issues of GeoTimes, but we realize it is time to report on the S&E Assistant's Program.

The old Scientific and Professional Personnel Program is on its way out. Like prohibition, a noble experiment, it was designed to make some professional use of the specialized knowledge college-trained scientists and engineers brought with them into the service. When everyone was being drafted indiscriminately, some 8,000 men were in the program—5,000 in reasonably adequate Grade A slots, and 3,000 in subprofessional, Grade B assignments.

The program was as good—or as bad—as the military installations where the men were stationed. At Huntsville, Alabama, superb military and research direction made this post a model that few others attained. At a small number the spit-and-polish mentality of obsolete commanders made the program a farce, and even a disgrace.

Last year the Army revamped and renamed the S&PP Program. It is now the Scientific and Engineering (S&E) Assistant's Program. To qualify for it, men must have either a master's degree or its equivalent in experience. Since the number of scientists and engineers being inducted for two years of service has dropped, the program will probably be limited to a complement of 2,000 men when it reaches full strength.

As of March 1, 1,078 S&C positions had been identified and approved. Of these, 209 were in electrical and electronics engineering, 87 in civil engineering, 103 in mathematics and statistics, 194 in the physical sciences, 113 in the biological sciences, and 78 in chemical engineering.

Approximately 70% of the men have been assigned to eleven installations—three each under the Chief Chemical officer and Chief of Ordnance, two each under the Chief of Engineers and Chief Signal Officer, and one under the Surgeon General.

To date not a single gripe about the new program has come to the Scientific Manpower Commission. We trust it is—and will remain—that good.

CONGRESS corner

news and information on the

INTERNATIONAL
GEOLOGICAL CONGRESS
NORDEN

August 15-25 1960

It is anticipated that there will be many members of the Society of Economic Geologists from all points of the globe in Copenhagen for the Congress. The Society, therefore, is arranging a reception and dinner meeting at 6:30 p.m. on Thursday, August 18 at *Haadvaerkerforeningens Selskavsloker, Moltkes Paloc, Dronningens Tvaergade 2, Copenhagen.* The event will be open to Society members, their families, and guests of members. The cost will be about 36.5 Danish Kroner ($5.50 US).

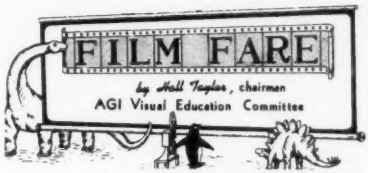
The German Geological Society is sponsoring a post-Congress field excursion at Bad Tolz, Upper Bavaria to study the stratigraphy and tectonics in the marginal areas of the Bavarian Alps. Information about this meeting which is scheduled for September 22-28 may be obtained by writing *Prof. Dr. Paul Schmidt-Thome, Secretary, Institut für Geologie der Technischen Hochschule, München, Arcisstrasse 21, Germany.*

If there is still an empty corner in your luggage and you have a pound or two to spare we would like to suggest three particularly useful publications for the budget-conscious travel. These are Europe on a Shoestring ($2.00), Europe by Car ($2.00) and Where to Stay, Eat and Shop in Western Europe ($2.00). All three are available from Harian Publications, Greenlawn, New York. They are packed with many intriguing and useful suggestions. Furthermore they are paper-backed to save weight and bulk.

Persons attending the Geological Congress may be sent mail to

post restante GEOLOGICAL CONGRESS
COPENHAGEN K

There will be a post office at the Congress where mail will be distributed during the Congress sessions (Aug. 15-25).



RIVERS. 16 mm. kinescope. Sound. Color. 28 minutes. 1959. With the aid of scenes shot in the field and laboratory, Dr. Luna Leopold of the U. S. Geological Survey, tells an interesting story about current research in stream hydrology. He describes the multitudinous uses of water, then considers its erosional and depositional activities as it moves through streams and rivers to the sea. A well planned and pleasantly narrated picture useful for the general public and for introductory geology classes. Originally filmed for the TV audience, this reel is now available for loan to schools and other educational groups upon payment of shipping charges. DISTRIBUTOR: *(temporary) Greater Washington Educational Television Assoc., Raleigh Hotel, 12th and Penn. Ave., N.W., Washington, D. C.*

REALM OF THE GALAXIES. 16 mm. Sound. Color. 19 minutes. 1959. Astronomers, through study of starlight, find much of wonder and awe and mystery in the heavens. Some recent discoveries, and the ways in which they have been made, are described in this film. Attention focusses particularly on Cepheid variable stars, with their implications of vast stellar distances in an exploding universe (or is it a hydrogen-forming steady-state affair?) which began perhaps 13 billion or so years ago. By showing something of the setting of our earth in space, this film provides a useful supplement to introductory work in historical geology. DISTRIBUTOR: *Horizons of Science, Educational Testing Service, 20 Nassau St., Princeton, New Jersey. Distributed on a subscription basis.*

ELECTRIC FIELDS. 16 mm. Sound. Black and white. 23 minutes. 1959. Dean Francis Bitter of M. I. T. discusses the meaning of "fields" as mathematical and physical entities, describing several different kinds, their vector addition, and their use in analyzing physical phenomena. Electric fields in action are shown with simple laboratory equipment. This film illustrates some of the basic principles upon which geophysical exploration is based, and would be useful in elementary geology classes which discuss this subject, particularly if student backgrounds in physics are weak. DISTRIBUTOR: *Educational Services, Inc., Physical Science Study Committee, 164 Main St., Watertown 72, Mass.* Distributed on a subscription basis.

STANFORD LECTURE PROGRAM

The School of Mineral Sciences of Stanford University sponsored a lecture series during January and February of this year on the general subject: *The Earth Sciences, Their Value Today.* The series was organized and directed by Dr. Harold Hoots, Consulting Professor in Geology. The speakers were men prominent in various fields of the earth sciences, and their talks described current research and problems in their respective fields. The talks were given each Monday afternoon and some of the speakers presented additional lectures at other times. The lectures were open to the public without charge. Attendance was excellent and included representatives of the United States Geological Survey and the California Division of Mines, numerous consulting geologists and engineers, faculty and students from local colleges and universities, and the general public. Some of those in attendance came from distances of several hundred miles. Audience response was enthusiastic and may result in presentation of a similar program next year.

Following are listed the lecturers appearing on the Stanford program and the topics on which they spoke.

A. I. LEVORSEN, Consulting Geologist, Tulsa
- *Regional Application of Paleogeologic Maps*
- *Time of Oil & Gas Accumulation*
- *Trends in Petroleum Exploration*

ARTHUR M. PIPER, Division Hydrologist, U.S.G.S., Menlo Park
- *Are you concerned about Water? You will be!*

PHILIP B. KING, U.S.G.S., Menlo Park
- *The Evolution of Western North America*

CAREY CRONEIS, Provost, and Harry Weiss Professor of Geology, Rice Institute, Houston
- *Mankind in Scientific Perspective*
- *South America—Resources, Peoples and Problems*

JACK GREEN, Research Geologist, North American Aviation Co., Pasadena
- *The Geology of the Moon*

J. HOOVER MACKIN, Professor of Geology, University of Washington, Seattle
- *Dam Site Geology*
- *Origin of Ore-Forming Fluids in the Iron Springs District, Southwestern Utah.*

DEAR SIRS:

As a member of the Geological Society of America I have been receiving regularly your publication: GEOTIMES.

I am writing this to inform you my permanent address. Kindly make the necessary correction in your records and mail all communications, henceforth, to the address shown above.

It's a pleasure to let you know that GEOTIMES is the only medium through which I get some news regarding the many American friends that I was privileged to know during my year's stay in the U.S.A. Any other reading matter of interest to the profession is always welcome.

Thanking you,

Cordially,

V. VENKATESH
Geological Survey of India
Calcutta 13, India

DEAR SIR:

Shades of Ivan T. Sanderson and the Satevpost!

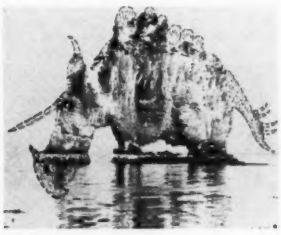
Those Pleistocene animals *were so*, frozen solid as shown by the cover of GeoTimes (March). The beast is obviously *Demopublican*, a hybrid form and shows that evolution moves slower than we think because the front half has his nose in the feed bag, while the back half carries the load, as of today.

Sincerely,

Santa Barbara Museum
PHIL C. ORR

DEAR SIRS:

In your cover photo for March you have misidentified what is obviously the remains of the Icelandic version of *Triceratops*. The unfortunate creature was undoubtedly buried by a sudden ash fall while in the act of taking a drink. A restored section is returned herewith.



Respectfully yours,

HERBERT ALLEN TIEDEMANN
Tenn. Dept. Conservation

DEAR EDITOR:

The readers of GeoTimes will be interested in some significant paleobotanical discoveries that were made by the writer in 1959 in the excavation of the American Chemical Society building, the new home of AGI on 16th Street in downtown Washington, D. C.

About 30 feet below street level, under buff-colored sediments of Pleistocene age, light green clay, sand, and gravel were encountered. These green sediments, which were about 10 feet thick, rested on deeply weathered preCambrian grey-green schist.

In the northeastern corner of the excavation the green sediments became somewhat carbonaceous. Here a lignitized stump of a fossil cypress (Cupressinoxylon) about two feet long and one foot across was uncovered. The wood structure was so well preserved that the workmen in the excavation considered it to be the remains of a modern tree.

A microscopic examination of the sands in which the wood was entombed revealed a remarkable Lower Cretaceous microflora consisting of an unusually large number of fossil spores and pollen grains from fungi, lycopods, ferns, cycads, and conifers as well as a few grains from representatives of the first dicotyledonous flowering plants which appeared during this time. A total of over 60 species have so far been recorded from this site. Of these, several appear to be new to science. This spore-pollen flora may prove to be one of the richest Lower Cretaceous microfloras so far discovered in this country.

The flora indicates that the green sediments in the lower part of the excavation of the American Chemical Society building belong to the Patuxent formation of Lower Cretaceous age, the oldest formation of the Atlantic Coastal Plain sedimentary sequence.

Very truly yours,

ARTHUR S. KNOX
U. S. Geological Survey

DEAR EDITOR:

The author of "Depletion" published on page 38, Geo-Times, Jan.-Feb. 1960, has received reproduction of letter dated March 9, 1960, written by Frank H. Madison, Mineral Tax Consultant, addressed to Geo-Times [GEOTIMES, Vol. IV, No. 7, p. 35].

"At no time in the law or in the regulations or in the various court decisions has depletion been called "return of capital."

"It follows that Mr. Hiestand is in error in saying there is a "total shortage in Capital Loss" in 1955 of $694,455,690."

These two quotations are typically "new deal" and eloquently justify my position taken in touring the United States and Canada to express the views of a geologist who assumes full professional responsibility to his clients regarding the geologic nature of depletion of producing oil and gas properties. And I am trusting that Mr. Madison will read the paper prepared from my lecture notes and being published in the American Association of Petroleum Geologists Bulletin this month. I should explain to Mr. Madison that my lecture contained no original information or interpretation, and that it was entirely documented by sources of information available to all petroleum geologists. A search of directories of American Association of Petroleum Engineers, A.I.M.P.E., fails to identify Mr. Madison as a member.

For his leisure reading I am enclosing reprint from Independent Petroleum Association of America Monthly, November, 1958, "Hazy Thinking and Misunderstanding is Removed from Percentage Depletion, Its Origin and Basic Purpose," by Gordon Jones, CPA. And on page 65, I have ruled with red pencil a quotation from Supreme Court decision delivered by Justice Brandeis (274 U.S. 295, 47 S.Ct. 608) ". . . deduction on account of depletion in determining the amount of taxable income from mines . . . is to be regarded as a *return of capital,* not as a special bonus for enterprise and willingness to assume risks."

For his casual reading pertaining to the petroleum industry in 1955, I am offering a reference, "Petroleum and Natural Gas in the United States—Relation of Economics and Technologic Trends," by C. C. Anderson at World Power Conference, Montreal, Canada, 1958. This author is the Chief Engineer, U. S. Bureau of Mines. From this paper it will be apparent that the Capital Loss in 1955 was the $694,455,690 which I stated was sustained by owners of producing oil properties within the United States.

"If there were, the many brilliant *lawyers* and *accountants* in the oil fields would have seen it long ago." Mr. Madison places a confidence in these professions whose members are sworn to protect their clients from committing errors in existing laws and regulations. And he only emphasizes the lack of civic responsibility among petroleum geologists and engineers who have not presented well known data to Management as employer or client which demonstrates a shortage in Capital Loss in the existing laws and regulations providing for deduction on account of depletion of producing properties.

Mr. Madison would enjoy meeting geologists at their convention in Atlantic City on April 24-28, 1960. Also he should come to the petroleum engineers' convention in Denver on October 3, 1960. And any time I shall be pleased to present all documentary data to Mr. Madison to allow him to learn for himself what the geologist is trained and educated to contribute to the petroleum and mining industries.

Sincerely,

Thomas C. Hiestand/h

You saw it in GeoTimes . . .

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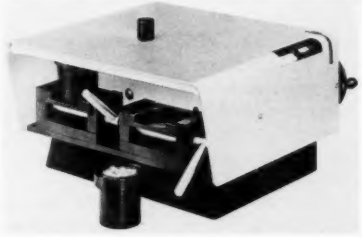

true volume, specific gravity or porosity of solids without use of a fluid medium. For further information write *Houston Instrument Corp., P.O. Box 22234, Houston 27, Texas.*

WILEY BOOKS

SUBSURFACE MAPPING

By Margaret S. Bishop, *University of Houston*. In this book the author discusses the various kinds of maps that may be constructed to present subsurface data and explains ways in which these maps are interpreted. Introductory material covers the drawing of contour lines and also gives a brief history of the mapping of geologic information. The book contains a thorough treatment of the procedure for constructing structural maps — and the newer stratigraphic maps, including isopach, facies, and the paleogeographic group. *1960. 198 pages. Illus. $5.75.*

OPTICAL CRYSTALLOGRAPHY, Third Edition

With Particular Reference to the Use and Theory of the Polarizing Microscope

By Ernest E. Wahlstrom, *University of Colorado*. Like its predecessor, this new edition is directed to newcomers to the field who are interested in the theory and practice of optical crystallography and to more advanced investigators who wish to review basic theory. Completely rewritten, the book offers a new chapter on crystal rotation methods and 100 new and improved illustrations, including both two- and three-dimensional drawings. *1960. 356 pages. Illus. $8.50.*

MICROSCOPIC SEDIMENTARY PETROGRAPHY

By Albert V. Carozzi, *University of Illinois*. This book presents "ideal" descriptions of sedimentary rock-types. These descriptions summarize both the most common appearances of a given rock-type and those variations which have broad significance. In practice, the investigator will quickly and easily find enough similarities between the case he is studying and the ideal description to relate the one to the other. *1960. 485 pages. Illus. $11.50.*

CRYSTAL-STRUCTURE ANALYSIS

By Martin J. Buerger, *Massachusetts Institute of Technology*. Designed for the reader who has no background in the subject, this book covers the entire field of crystal-structure analysis, i.e. the process of discovering the arrangement of atoms in crystals. In a clear step-by-step presentation, it offers theoretical and practical discussions of all the available analytical procedures and sets forth the proper methods for selecting material and gathering and correcting data. *Ready May 1960. Approx. 664 pages. Prob. $16.00.*

Send for examination copies.

JOHN WILEY & SONS, Inc.

440 Park Avenue South **New York 16, N. Y.**

PETROLEUM GEOLOGY, SECOND EDITION, *by K. K. Landes, 433 pp., 1959, John Wiley and Sons, Inc., 440 Fifth Ave., New York 16, N. Y., $9.50.*

Much of this book has been completely revised in order to include new data resulting from advances in petroleum geology during the past decade. Primarily a college textbook, it will also be found on the bookshelves of practicing geologists.

APPROACH TO ARCHEOLOGY, by *Stuart Piggott, 134 pp., 1959, Harvard University Press, Cambridge 38, Mass., $3.00.*

Many geologists will find most interesting this book on the principles of the archeological approach to the human past.

NATIONAL ADVISORY COMMITTEE ON RESEARCH IN THE GEOLOGICAL SCIENCES, *9th Annual Report for 1958-59, 216 pp., 1960, Geological Survey of Canada, Ottawa, $0.50.*

The excellent annual report on the status and progress of research in the geological sciences in Canada again is worthy of the attention of all geologists who attempt to keep informed in advances in basic research. The Canadian Survey is to be commended highly for this annual report.

GLOSSARY OF METEOROLOGY, *Ralph E. Huschke, Editor, 638 pp., 1959, American Meteorological Society, 3 Joy St., Boston, Mass., $10.00.*

A glossary of more than 7200 entries. It differs from the AGI Glossary in that it provides current definitions of Meteorological terms but does not cite original references.

GEOLOGY AND MINERAL RESOURCES OF JAPAN, *edited by Tsukasa Murakoshi and Katsumi Hashimoto, 266 pp., 1956, Geological Survey of Japan, 135 Hisamoto-cho Kawasaki City, Japan.*

A review of the geology of Japan (137 pages) and a brief description of the mineral deposits.

PHYSICS AND GEOLOGY, *by J. A. Jacobs, R. D. Russell and J. Tuzo Wilson, 424 pp., 1959, McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y., $9.75.*

This book is the product of a physicist, a mathematician and a chemist, with considerable back-stopping in geology. The geology subject matter is confined primarily to that involving physical principles. The artificial boundary which geologists and geophysicists insist on developing between what they view as geology versus geophysics appears as a ridiculous, untenable position to the reader of this well organized, informative book.

SYMPOSIUM ON BASIC RESEARCH, *Edited by Dael Wolfle, 328 pp., 1959, Publication No. 56, Amer. Assoc. Adv. of Science, 1515 Massachusetts Ave., N.W., Washington, D. C., $3.00.*

A collection of outstanding papers on the concepts of basic research from a conference sponsored jointly by the AAAS, the NAS, and the Sloan Foundation in May 1959. Geologists will be interested in the quotations credited to the renowned early geologist, T. C. Chamberlain as a commencement speaker at the University of Wisconsin in 1904 (p. 89-90).

METHODS AND CASE HISTORIES IN MINING GEOPHYSICS, *arranged by a Committee of Geophysicists of the Canadian Institute of Mining and Metallurgy, published by authority of the General Committee of the Sixth Commonwealth Mining and Metallurgical Congress, 359 pp., 1959, Mercury Press Company, Montreal, Que. Available from Canadian Institute of Mining and Metallurgy, 906 Drummond Bldg., Montreal 2, Que. Price: $10.00 (Canadian) $8.00 to qualified students.*

This volume was prepared to provide delegates to the Sixth Commonwealth Mining and Metallurgical Congress with a study of exploratory work of the geophysicist related to development in some Canadian mining districts visited during the Congress tour; also examples of geophysical surveys in other countries of the Commonwealth. The material was planned primarily for nongeophysicists—for mining engineers, geologists, and civil engineers concerned with mineral resource development.

ERRATA

The column, Popular Geology in Print, in the April issue of GeoTimes (p. 40) there was a review of Geodesy for the Layman. It was indicated that this publication is available free of charge; this was in error. The above-mentioned publication should be ordered by identification number TU161372 from the *Office of Technical Services, Department of Commerce, price $2.25, check or money order should accompany order.*

background in the subject fields, there will be mediocre salaries for all teachers and the public will continue to be dissatisfied with the schools.

3. Take the required education courses. The number of credit hours required for a temporary certificate in most state is negligible and this will help considerably in obtaining a job. Additional credits may be earned in summer school. The geologist planning for industrial employment should consider the advisability of taking education courses as an investment toward a possible rainy day in the future.

4. Have a sincere interest in young people and their problems. Recognize that they learn most readily through first-hand experience.

5. In spite of recent criticism of school curricula, remember that it is generally overcrowded with subjects and administrators are usually reluctant to make changes. If geology is put in, something must go. We must be ready to *prove* that earth science is better than what is presently being offered.

Ripe for Change

Point 5 should be treated in more detail. Some school systems dictate the curriculum so precisely that virtually no changes can be made. This situation is more prevalent in biology, chemistry and physics, but general science is ripe for change because there is so much dissatisfaction with it. In addition to offering general science at the ninth grade level, many schools include general science in the seventh and eighth grades, and some are introducing a modified form of it in the elementary grades as well! There are many reasons for disillusionment with general science, particularly at the ninth grade level.

1. Where can teachers be found who have a broad knowledge of a multitude of growing science fields? Many general science teachers are not well trained in *any* field.

2. How do you plan what is to be taught at the various grade levels considering the diverse training, experiences, and abilities of the teachers? What happens when teachers leave the school system?

3. Students become bored with "general" science year after year. In the ninth grade, most of them take algebra and many have foreign languages. Aren't they ready for a less "general" science course?

4. There is a strong tendency for repetition of subject matter from year to year since general science usually skims lightly along the surface, barely touching upon many topics and never treating any of them in detail.

5. General science is a hodgepodge of unrelated information. Today students are learning about insects and next week they will study atomic energy. How will they discover the inter-relationships of scientific disciplines?

Geology as Foundation

There is one solution to all of these problems and many more: a ninth grade course in *earth science*. Using geology as the firm foundation, this course can reach out to include the atmosphere and even the universe! The timeliness of such a course makes it a "natural". Earth science could take its place along with biology, chemistry and physics as one of the important high school laboratory sciences. If ninth grade general science has so many drawbacks, why didn't earth science replace it long ago? For one thing, there aren't enough teachers who have had the proper training to teach it. New York has had an earth science program for many years but the lack of qualified teachers has been a limiting factor.

Earth science teaching is a possible *new field* for geologists who wish to embark upon a permanent career. The training of geologist teachers should be a five year program which will culminate with the masters degree. In addition to the basic courses in geology, at least a full year of biology, chemistry, physics and mathematics should be included. Introductory courses in astronomy and meteorology are recommended since most earth science courses include these areas. Most states require approximately 18 credit hours in education and these should be taken near the end of the student's college career so that he can use his scientific background during the student teaching experience. It would be wise to have enough credits in biology, chemistry, or physics so that certification may cover one or more of them as well. Administrators who hire teachers are better impressed by applicants who are prepared to teach more than one subject, even if they are never asked to do so. Most important of all, as part of their training, all college students should have opportunities to do *original scientific research*. They cannot be expected to impart a true feeling for science in youngsters if they do not

OUT IN SPACE
OR DOWN TO EARTH?

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СЕРИЯ ГЕОЛОГИЧЕСКАЯ

How do the Russian geoscientists compare with us in the fields of:

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Mineralogy - Petrology
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really know science themselves! Too many teachers have taken only a few elementary college courses in science where the lecture sections are large and the laboratory work is routine.

If the school earth science course is successful, benefits to be derived by the geologic profession are obvious. Perhaps a better-informed public would not tolerate geologic recessions in the future. However, geology has barely gotten her big toe in the door of public education. So far, New York and Pennsylvania are the only states that have large scale earth science programs, and much of the teaching is being done by untrained but enthusiastic personnel. Other states are beginning to show some interest. In New York, earth science is being recommended only for the brighter ninth graders but we need to think carefully as we say geology is too difficult or of little value for the majority! Most schools do not presently provide laboratories for ninth graders, but some are being built. Teachers salaries are only fair but they are climbing steadily. Field trips are difficult to arrange but the English and history teacher can sometimes be soothed by an explanation of how the trip will correlate with what they are doing. Most of all, the schools do not know that earth science is better than what is now being taught and they must be convinced. The geologist who starts teaching today will probably have to begin with general science, biology, chemistry, or physics. He will then have to persuade the school administration that earth science is needed.

Without a doubt, earth science teaching can represent the greatest triumph for geology in the next twenty years if the profession will get behind it. This is not merely a solution to a sticky employment problem for geologists or for the schools. This is an opportunity for competent geologists who are interested in aiming their careers toward developing appreciations of the earth in tomorrow's citizens and scientists!

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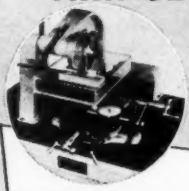

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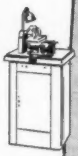

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ROCK CHIPS

by SANDSTONE SAM

Prominent names in geology's hall of fame:

Geo(rge) Times
G. O. Scienceabstracts

• • •

A sticky situation for the editor:

". . . molasses sediments fill a subsiding depression, but the subsidence is due to internal causes"

• • •

The student says:

Red beds are indicative of desert conditions past, present and about to begin.

Courtesy KTC Geological Newsletter

• • •

The Atlanta Journal recently clued the public in on the inside dope on the offshore interests of a major oil company. According to the report the company had no special information on which it is basing its play "other than what archeologists think."

You saw it in GeoTimes . . .

CAVE NOTES is an international bimonthly review and commentary on current articles, books and topics concerning caves and karst, published by a nonprofit organization for scientific study. For further information write *Cave Research Associates,* 2205 F Comal St. *Austin 2, Texas.*

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STRATO-DRILL is a new reverse circulation portable drill rig which permits continuous coring from the grass down by circulating 6" lengths of 2" diameter core to the surface through the core tube. For more information write STRATO DRILL, INC., 828 *South 75th St., Houston 23, Texas.*

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ROCKSHOCK is a new implosion–type treatment service for completion or reworking of oil and gas pay zones. For further information write *Dowell, P.O. Box 536, Tulsa, Oklahoma.*

(Continued from page 13)

tains, sometimes at a distance from the seas."

Here we see that he thought a mountain might possibly be formed and eroded to base level within the written record of mankind.

Leonardo's Greatest Contribution to Geology

If asked a few months ago (before commencing this paper) what I considered to be Leonardo's greatest contribution to geology I would have unhesitantly replied, "His work regarding fossil marine invertebrates." After studying his life and work more closely I am not so sure that I could now give the same reply to that question. It seems to me that his greatest contribution to geology and perhaps to all science stems from his astounding capacity to disregard, or treat with suspicion traditional beliefs concerning the earth, and his apparent immunity to any temptation to entertain strong, pre-conceived ideas about natural phenomena, or the results thereof, not based on actual field observation. Thus he set an admirable example that all present day geologists should consider a necessary and fundamental approach to geological research and scientific thinking.

Summary

1. Da Vinci recognized the true origin of fossils. Although he was not the first to do so, he was, perhaps, the first to elaborate on his ideas and should be given credit for having established fundamental principles concerning paleontological research.
2. He was one of the earliest ecologists and paleoecologists.
3. He had more than a vague idea concerning the processes of fossilization.
4. He had some concept of paleogeography and earth movements.
5. He fully appreciated and perhaps over-emphasized the work of running water.
6. He recognized more than 200 years before John Playfair, that streams usually form their own valleys.
7. He probably knew that the earth was more than 6,000 years old, but indicates he had no idea that its age could be measured in millions of years.
8. Perhaps his greatest contribution to geology was his example of not entertaining pre-conceived ideas about geological phenomena that he had not observed and studied in the field.

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Earth Science Sections

Vol. 124, Nos. 1-6

January-February 1959

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GEOLOGY
GEOCHEMISTRY
GEOPHYSICS
PETROGRAPHY
MINERALOGY
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INT. UNION PROPOSED

(Continued from page 10)

Draft Statutes of an International Union of Geology

I OBJECTS OF THE UNION

1. The objects of the Union are:—
   (a) to promote the study of geological problems
   (b) to facilitate international cooperation in geology

II MEMBERSHIP

2. Each country may adhere to the Union through its national academy, national research council or its Government acting through a national committee representing geology in that country.
3. There shall be three categories of membership of the Union. Each country shall pay annually a subscription according to its category of membership. A country offering to adhere to the Union shall specify in which category it proposes to be classed.

III ADMINSTRATION

4. The work of the Union shall be directed by
   (a) the Council of the Union
   (b) the Executive Committee
   The composition and function of these bodies are defined in the following articles.

IV THE COUNCIL OF THE UNION

5. The Council of the Union consists of representatives of the national adhering organizations, one representative for each country and the Executive Committee of the Union.
6. An ordinary meeting of the Council shall normally be held every three or four years, at a place and date determined by the Council, or failing that, by the Executive Committee. The General Secretary shall communicate the place and date of the meeting to the members of the Union and to all members of the Executive Committee at least six months in advance.
7. Resolutions from members of the Union for submission to the Council should reach the General Secretary at least four months before the meeting.
8. The agenda of the meeting of Council shall be communicated by the General Secretary to the members of the Union and to all members of the Executive Committee at least three months before the first day of the meeting. No question which has not been placed on the agenda can be discussed, unless a proposal to the effect be approved by not less than two-thirds of those present and voting.
9. Whenever a vote is taken each national adhering organization has one vote. The vote of each national adhering organziation must be given by a representative (or alternate) nominated by that organization. Decisions of the Council shall be taken by a majority of those present and voting: in the event of an equal division of votes, the Chairman shall take the final decision.
10. For special reasons, the President may, with the consent of the Executive Committee, summon an extraordinary meeting of the Council. He is obliged to do so at the request of one-third of the national adhering organizations of the Union.

V POWERS AND FUNCTIONS OF THE COUNCIL

11. The Council elects the Executive Committee of the Union.
12. The Council has power to appoint any Committee it may seem necessary for the administrative and scientific work of the Union.
13. The Council reviews and approves the Report of the Executive Committee on the administration of the Union for the period elasping since the previous Council meeting.
14. The Council examines and approves the accounts for the years elapsing since the last session of the Council, and discharges the Treasurer of liability.
15. The Council decides, on the proposal of the Executive Committee, the annual contributions applicable to each category of membership*).
16. On the proposal of the Executive Committee, the Council examines applications for membership of the Union which it may accept or reject.
17. The Council shall consider, and may ratify, By-laws proposed by the Executive Committee.

*) It is suggested that the annual subscriptions might be 150 U.S. dollars, 450 U.S. dollars and 900 U.S. dollars for the three categories of membership proposed (see Statute 11.3). There might be a fourth category with a subscription of less than 150 U.S. dollars or associate members might be admitted.

18. The Council may, by a two-thirds majority vote of the members of the Council present, cancel the membership of any member of the Union which fails to fulfill its obligations.

VI Executive Committee

19. The Officers of the Union, elected by the Council of the Union, shall consist of a President, four Vice-Presidents, a General Secretary and a Treasurer, and shall constitute the Executive Committee.
20. The members of the Executive Committee hold office until the close of the ordinary meeting of the Council following that at which they were elected.
21. The President and Vice-Presidents are not eligible for re-election to the same office, but other officers are immediately eligible for re-election.
22. The Executive Committee shall present a report of its activities at meetings of the Council.
23. The Executive Committee shall act on behalf of the Council betwen meetings of the Council.

VII Commissions

24. The Council may entrust to a Commission the conduct of its work in particular geological matters.
25. The chairman and members of each Commission shall be elected by the Council on the proposal of the Executive Committee. They remain in office until the next session of the Council and are eligible for reappointment.
26. Except as otherwise determined by Council a Commission is composed of a maximum of six full members and a limited number of corresponding members.
27. Commissions will present reports of their work to the Council of the Union.
28. With the approval of the Council or the Executive Committee a Commission may issue its own publications, and may entrust any part of the work to national institutions or to individuals.

VIII General Provisions

29. These Statutes shall come into force as soon as they have received approval of the Council of the Union. No change shall be made in the Statutes except with the approval of two-thirds of the votes of the members of the Council present and voting.
30. The English text shall be considered to be the authoritative text in the interpretation of these Statutes.

EARTH SCIENCE AWARDS BY NSF

Of 145 Post Doctoral Fellowships awarded recently by the National Science Foundation for advanced research in science, mathematics and engineering 6 were awarded in the earth sciences as follows:

William A. Clemens, Jr., Univ. of Cal., Berkeley, for study at the Univ. of London.

Gerald K. Czamanske, Stanford Univ., for study at the University of Oslo.

Richard S. Fiske, the Johns Hopkins Univ., for study at the University of Tokyo.

William H. Fritz, Univ. of Washington, for study at New Mexico Inst.

Leon E. Long, Columbia Univ., for study at Oxford University.

John S. Steinhardt, University of Wisconsin, for study at Harvard University.

Applications for awards to be made in October 1960 will be received in July. For details write the *Fellowship Office, National Science Foundation, Washington 25, D. C.*

Historic House Restored for Geologists' Office

Built in 1793, historic Lloyd House in Alexandria, Virginia is being saved from destruction and restored to its original architecture by Robert V. New of Wilmington, Delaware, to house the Geological Department of the Green River Basin Corp. Twelve staff geologists are expected to move into the renovated house in September.

An early occupant of the house was Benjamin Hallowell who once taught General Robert E. Lee. Tradition has it that Lee was being entertained in Lloyd House when he received word that he was commissioned a general in the Confederate Army.

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INSTRUCTOR to teach physical and historical geology, mineralogy, petrology, 12 hr. course load. Prefer young Ph.D. Write Chairman, Dept. Geology, Newark Colleges, Rutgers Univ., Newark 2, N. J.

LEHIGH UNIV., Bethlehem, Pa. Sept. 1960. Petrology-Geochemistry or Petrology-Tectonics. Teaching, research, and directing graduate work. Ph.D. under 40. Several years experience and publications desirable. Include reprints, references and resume. Write H. R. Gault, Chairman, Dept. of Geology.

SCIENTIST (GEOLOGY) to do field and office work including Research, studying and analyzing geological materials, geological mapping, collecting data on mineral resources, compiling reports in the New York State Education Department in Albany, N. Y. Salary range $6098 to $7388 in five annual increments, all civil service benefits. Requires B.S. in geology and one year of geology experience. In addition, two more years of geology experience or 60 graduate semester hours with specialization in geology or equivalent combination. Nationwide written test on June 25. For detailed announcements and applications, write to Recruitment Unit, Box 27, New York State Dept. of Civil Service, Albany, N. Y.

GEOLOGIST, MS or Ph.D., to teach Paleontology and Structural Geology, and prepared to teach stratigraphy, sedimentation, optical mineralogy, micropaleontology, or other specialties in future years. Will have full freedom in determining content of courses. Must speak Spanish. Academic year begins Sept., 1960. Salary far from high, but compensated by unspoiled opportunities for field research. Inquiries, complete credentials, photo, to dept. of geology, Universidad de Oriente, Santiago de Cuba, Cuba.

POSITIONS WANTED

BOX 611. ASSISTANT PROFESSOR, Ph.D. major university wishes to teach in college or university in more desirable area. 3 yrs. teaching and 6 yrs. varied industrial experience. Primarily interested marine geology, paleontology, sedimentation, mineralogy. Active researcher, member prof. societies. Resume on request.

BOX 612. MUSICIAN and composer; full professor; major university; Yale graduate; 13 yrs. teaching experience; former violinist in internationally famous string quartet; Guggenheim Fellow; married; 2 children; wishes to teach in college or university in more desirable area; amateur geologist; would appreciate your bringing this ad to the attention of your Music Department. Resume on request.

BOX 640. PETROLOGIST, 38, Ph.D. '52.

BOX 646. GEOLOGIST, broad exploratory background in the Four Corners, Panhandle and West Texas. Eight years experience includes subsurface, administration and seismograph. Some field and well work. Desires more responsibility.

BOX 676. PETROLEUM GEOLOGIST-Stratigrapher, 32, M.S., family, 6 yrs. varied exp. U.S., Canada and Foreign with major oil and consulting. Desire position of responsibility in research or exploration. Executive ability, presently chief geologist. Consider any reasonable offer.

BOX 681. GEOLOGIST, M.S., 39, family, 9 years teaching experience in eastern and midwestern universities. Several summers experience with state geological survey and consultant for private corporations. Chief interests sedimentation, mineralogy and petrology. Will consider either a teaching position or an industrial offer. Available end of summer.

BOX 689. PETROLOGIST-GEOCHEMIST, 32, Ph.D. Five years experience in major oil company research laboratory in fields of x-ray and spectrographic analysis, clay mineralogy and geochemistry of sediments. Broad graduate background in geology. Teaching experience in elementary geology, physics, and chemistry at small college. Desires position at college or university. Available in late August, 1960.

BOX 694. GEOLOGIST, Ph.D. Eastern University 1960—desires teaching position. Teaching experience: 3 years. Courses taught: physical and structural geology; mineralogy; petrology; economic geology; physiography of N. America. Able to teach any elementary geology course and advanced courses in crystallography, petrography and petrology. Field experience—Newfoundland and Maine.

BOX 703. GEOLOGIST, Ph.D. (Minn.), 40, with a large and happy family. Eight seasons in varied polar work, mostly in the Canadian Arctic; four years University teaching in Introductory Geology, Geomorphology, Photogeology, Glacial and Pleistocene Geology; and four years University Extension teaching in Physical Geology, Mineralogy, Rock Study, and Glacial and Pleistocene Geology; am currently teaching. Member of various professional societies, Sigma Xi, and Phi Beta Kappa. Desire to teach in N. central, N.E., or S.W. U.S. Available in summer/fall, 1960.

BOX 713. GEOMORPHOLOGIST-GLACIAL GEOLOGIST, Ph.D., 36, desires teaching position in midwestern or northeastern college with graduate program, or undergraduate program with research encouraged. In addition, can teach ground water and structural geology. Four years with Ground Water Branch, USGS, five years in teaching, publications. Resume on request.

BOX 716. PALEONTOLOGIST, Ph.D., 33, five years teaching experience. Specialties geochemistry and paleoecology but have taught courses in many other areas. Desires teaching position with opportunity for research starting September, 1960.

BOX 722. GEOPHYSICIST—M.S., Mining Engineer, equivalent Ph.D. level in geology, 25 years domestic and foreign experience in oil exploration with major oil companies, presently employed in Geophysical Research Group, seeks employment with broader scope. Speaks four languages, married, no children.

BOX 723. SEDIMENTOLOGIST - STRATIGRAPHER, 26, married, family; thorough background in mathematics, physics, chemistry; field and research experience in geology, physics, creative ability. Desires field-research position in area where family can accompany.

BOX 724. Ph.D. wishes to teach MINERALOGY, Economic Geology, Petrography, Spanish. Formerly Asst. professor at Northwestern and Lehigh Universities and Bryn Mawr College. Worked as Economic Geologist in Latin America for 42 years. Age 73. Excellent health.

BOX 726. GEOLOGIST, Ph.D. expected Aug. 1960. Single, 28, desires teaching position and opportunity for research with western school (preferably). Three years varied industrial experience, publications. Interests: physical, historical, petroleum, sedimentation, stratigraphy, field mapping, etc.

POSITIONS WANTED—*Continued*

BOX 727. GEOLOGIST, 45, single, desires position as liaison geologist, sales representative, administrator, or special jobs. 15 years foreign oil experience; speak Spanish & Portuguese. Available on short notice; have passport.

BOX 728. GEOLOGIST M.S. (Geol.), 25, family, 1½ years varied experience in engineering geology and industrial mineral exploration. Presently employed. Desire position in western United States in mineral exploration or engineering geology. Available during 1960 upon reasonable notice.

BOX 729. STRATIGRAPHER-PALEONTOLOGIST, Ph.D., 34, married, 5 years teaching experience and 5 summer field seasons with major oil company and mining company in Rocky Mountain-Great Basin area. Presently assist. Professor in small western college but desires change to more progressive department or would consider exploration research position in industry. Member of professional societies. Resume on request.

INVERTEBRATE PALEONTOLOGIST, M.A., '59, 28, single. Would enjoy research, but will consider laboratory technician work. Have 6 months museum experience, 1 year, 3 months as research assistant. Anywhere in U.S., prefers Western U.S. Salary open. Resume on request. Miss Joan Echols, Box 185, R. R. 5, Austin 4, Texas.

BOX 730. PALEONTOLOGIST-STRATIGRAPHER. Desires permanent teaching position. 11 years teaching experience in paleontology, stratigraphy, sedimentology, historical geology. Publications. Available Sept. 1960.

BOX 732. MINING GEOLOGIST, Ph.D., 37, married, one child. 8 yrs. experience in mining, exploration, evaluation, mineral economics and some geophysics, in U.S. and Latin America. Desire responsible position in mining, U.S. or foreign. Presently employed. Excellent references. Resume on request.

BOX 733. GEOLOGIST, Ph.D. with broad teaching background desires teaching position or museum work. Principal fields taught: Petrology, mineralogy, structural geology, geomorphology, paleontology, economic geology. Can teach other geological fields and biology.

GEOLOGIST. Hons. B.Sc. London University specialized; structural, stratigraphy, petrology; seeks position in petroleum geology, U.S.A./Foreign. Experience; field mapping; electronic instrumentation. Married. No children. Ford, 103 Moonachie Ave., Moonachie, N. J.

BOX 734. GEOLOGIST, B.A., M.S., 24, married. Three summers experience in engineering geology with major engineering firm. Desires position in engineering, exploration, or mining geology.

BOX 735. ASSOCIATE PROFESSOR, Ph.D. major college. Principle interests in sedimentary petrology, sedimentation and micropaleontology, wishes to relocate in southwest or west, either in teaching or in research laboratories of major oil company. Preferably in large city. Six years experience with major oil company and five years teaching experience.

BOX 736. Ph.D., 32, GEOCHEMIST-Petrologist. Teaching at midwest university. Desires a change to a department with better research facilities and opportunities.

BOX 737. PROFESSOR, Ph.D., 42, married. Chairman of Department at well-known midwestern liberal arts college, 13 years teaching experience. Publications, extensive field experience oil, state survey, mining, and field camp director. Principal interests; structure, stratigraphy, field geology. Desires teaching position with opportunity for research. Will consider oil or research openings. Resume and references on request.

BOX 738. GEOLOGICAL ENGINEER, 34, Ph.D., Univ. of Calif., economic geology, petrology, structure and vulcanology, adequate background, university teaching, several seasons mineral exploration and three years consulting, wants challenging teaching and/or research position.

BOX 739. GEOLOGIST, Ph.D., 34, married. Five years with foreign, national industrial planning agency as economic geologist and adviser mineral resources development; also university and post-university experience basic and applied research economic geology. Desires teaching position with college or university with adequate library and other facilities for research in geosciences OR research position in industry. Details on request.

BOX 740. EXPLORATION GEOLOGIST, 34, 10 years highly varied experience in Africa, Latin America, Canada, USA. Speaks Spanish. Seeks responsible position in Western USA, tropics, or subtropics, in any phase of mineral exploration.

BOX 741. GEOLOGIST-33, single, excellent health; Ph.D.; fluent 5 languages; 6 years experience examining prospects, organizing mineral exploration; several discoveries; wants foreign assignments evaluating prospects.

BOX 742. GEOLOGIST, Ph.D., 28, seeks teaching position in stratigraphy, paleontology, geomorphology and pleistocene geology. 2 yrs teaching experience (Assistant Professor) and 8 field seasons in Rocky Mountain area with USGS and major oil company. Prefer small college in Midcontinent, Rocky Mountain or Cordilleran area. Will accept heavy teaching load and departmental responsibility.

BOX 743. GEOPHYSICIST, Mathematical Engineer, Geologist. Minn. 1953-54. Petroleum or Space Physics, Hi-freq. reflections, Xistors, electrofluid light polarizers, terrestrial electrostatics.

BOX 744. BRITISH GEOLOGIST, B.Sc., F.G.S., 25, unmarried, completing Ph.D. 1960, available October 1960. Specialized in micropaleontology, sedimentary petrology, field mapping. Teaching experience. Prepared to go anywhere. Seeks employment in Petroleum Industry.

BOX 745. FIELD GEOLOGIST-TECHNICAL WRITER. Husband-wife ready to begin careers as petroleum exploration geologist and technical writer respectively. He B.S. geology; she B.A. journalism. Currently he is Air Force navigator; she is civilian editor of an A.F. wives' publication. Both some Spanish. Prefer Western States or foreign positions. Available June.

BOX 746. GEOLOGIST, Ph.D., structural geology, sedimentary petrology, economic geology including exploration and evaluation techniques. Thirteen years experience in North and South America. Desires university position.

BOX 747. GEOLOGIST, Ph.D., seeks position with State Survey, Research, Teaching, oil, domestic or abroad. Eight years experience in oil exploration in Great Basin, Oklahoma, North Africa, etc. Main experience in Stratigraphy, Lithology (carbonate rocks, microlithology), Regional Geology, Structural Geology. U.S. citizen, Swiss origin, German, French fluently. Married, two children.

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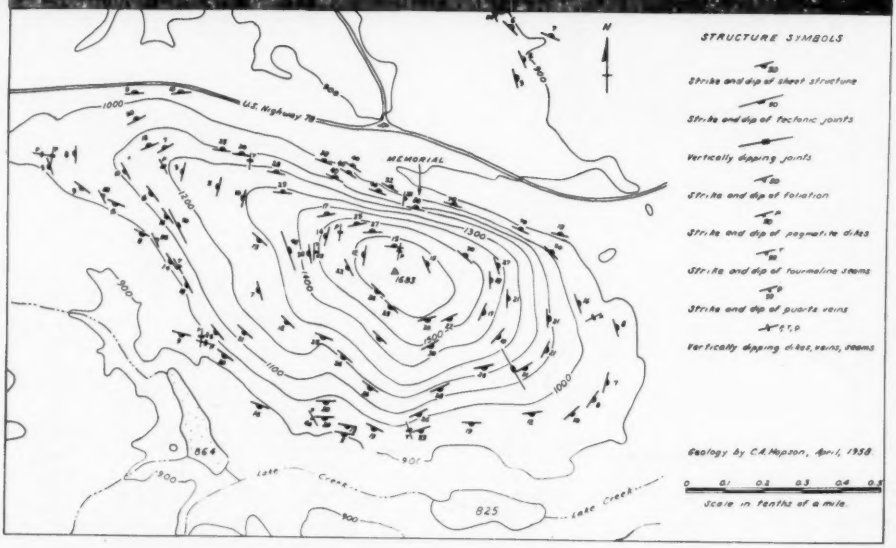

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